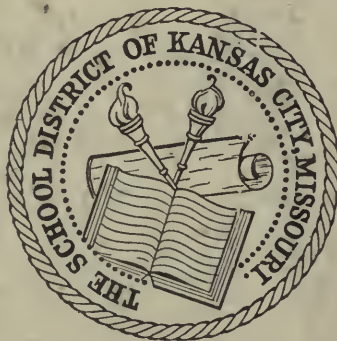
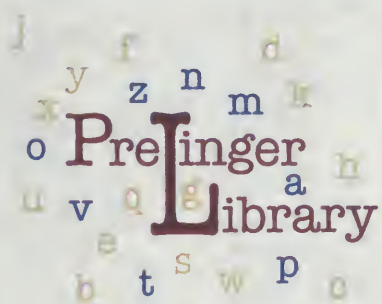


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The Reclamation Record

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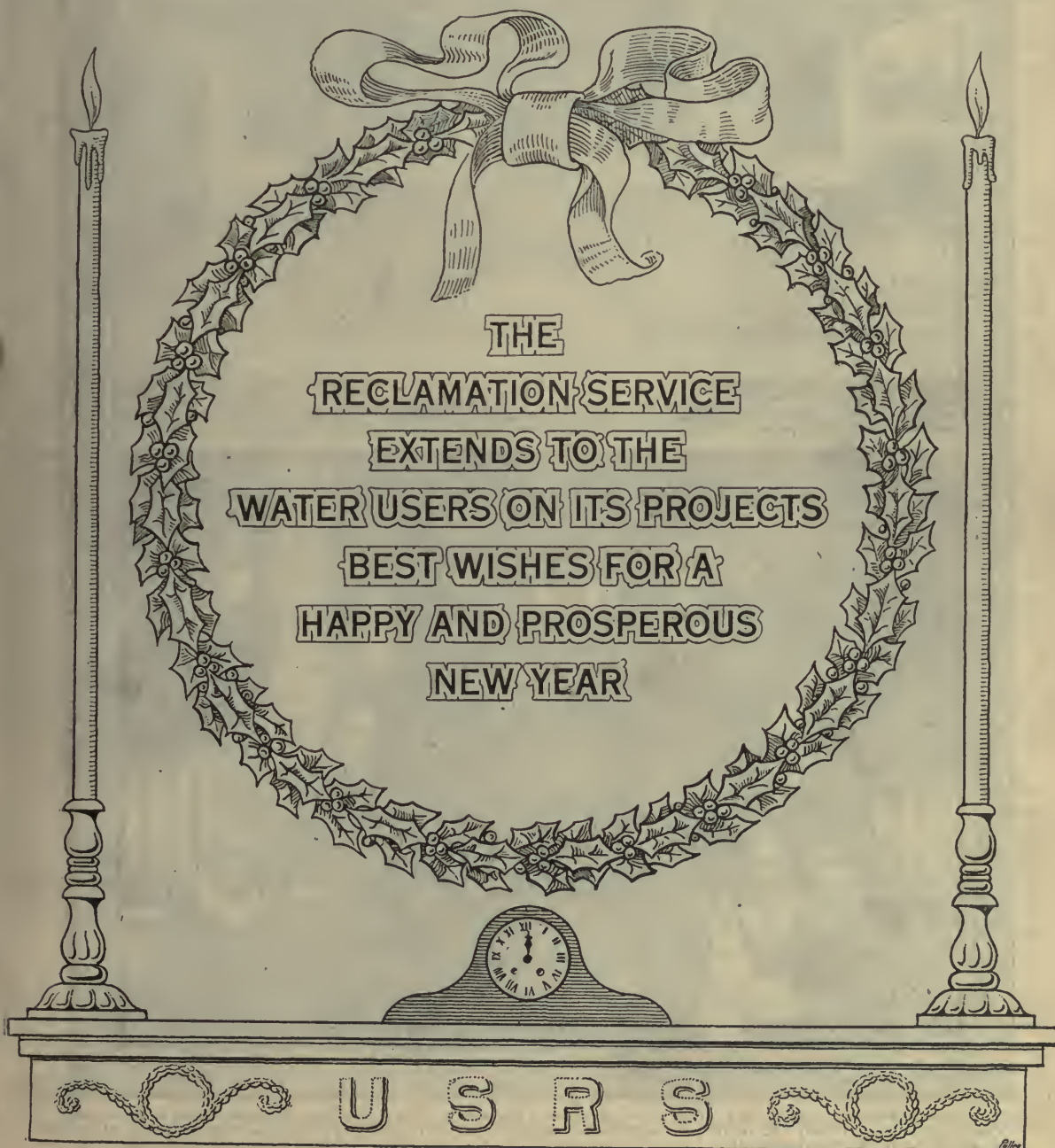
Better Farming : Better Business : Better Living

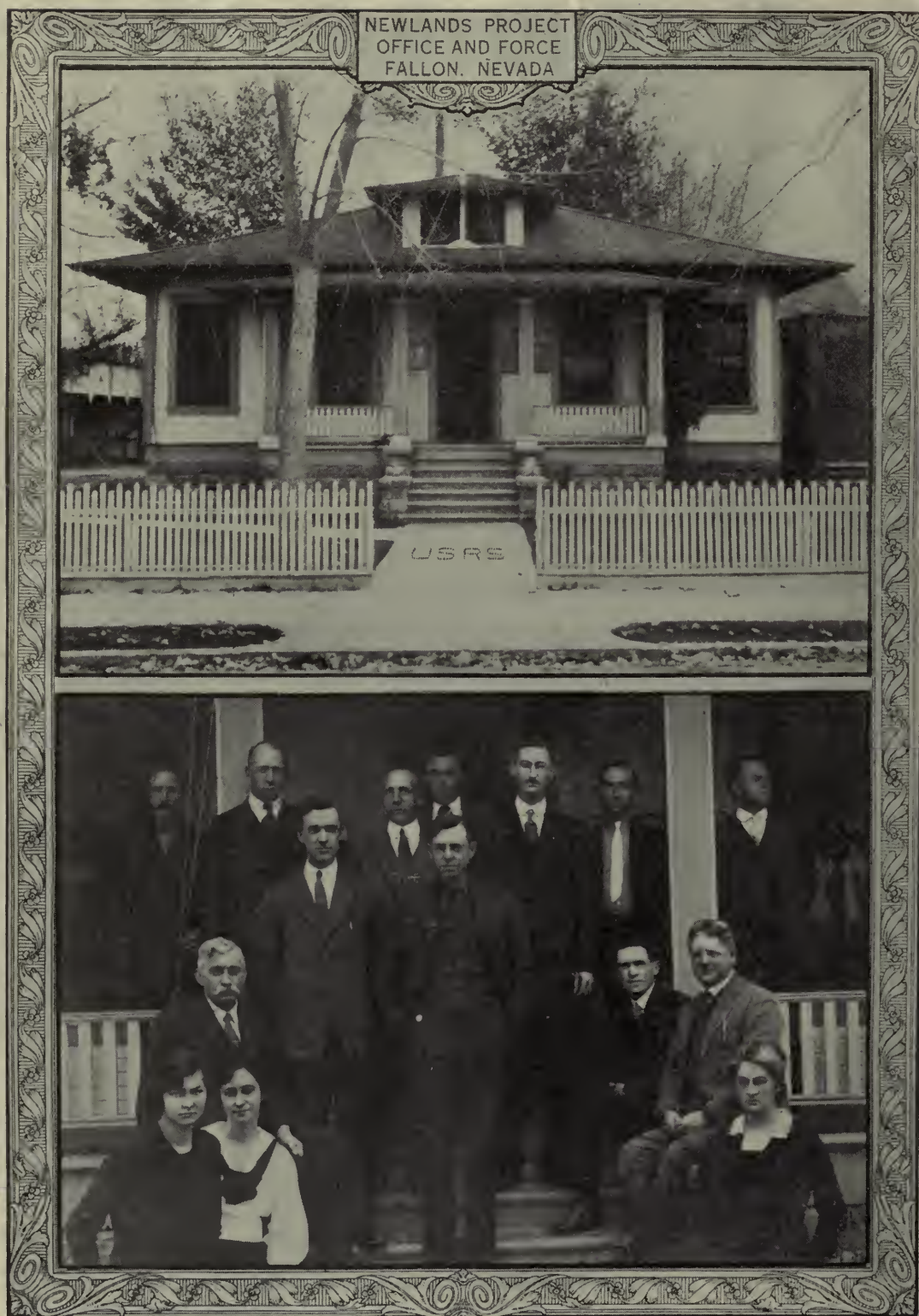
THERE CAN BE NO Surer INSURANCE FOR THE NATION THAN TO PUT ITS MEN UPON THE SOIL

VOLUME 12, No. 1

PRICE (FREE TO OUR WATER USERS
(SEVENTY-FIVE CENTS A YEAR TO OTHERS

JANUARY, 1921





Left to right. Standing: M. J. McCormac; Geo. B. Snow; Herbert A. Yates; Theo. H. Osmundson; G. C. Snell (rear); Thos. Hawthorne (front); F. G. Hough, examiner of accounts; L. F. Canterbury; S. R. Marean. Sitting: Miss Effie M. Jemison; W. A. Simmonds; Miss Ethel M. Simmonds; H. A. Cox, district counsel; John F. Richardson, project manager; Miss Jessie G. Yates.

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THE NORTH PLATTE VALLEY.

Suggestions for Future Development.

By Andrew Weiss, Project Manager, North Platte Project, Nebr.-Wyo.

SYNOPSIS.

A general survey of present agricultural conditions and of the records of recent developments in the North Platte Valley discloses the following principal points:—

(a) The portion of the river valley west of Kearney, Nebr., needs irrigation and drainage construction to insure its maximum possible growth.

(b) Recognition of this fact prompted the construction of extensive irrigation systems during the period 1890 to 1895, particularly during the drouth period 1893-1894.

(c) The outstanding characteristic of the North Platte River in Nebraska is its wide, shallow channel. This is still more pronounced in the Platte River, the width of which varies from 4,000 to 6,000 feet. This form of stream bed exposes a proportionately large surface to evaporation and percolation.

(d) The direct result of this physical characteristic is an extremely sensitive reaction of the river to changes in temperature, humidity, wind movement, and all factors and conditions which control evaporation and percolation losses.

(e) A secondary result of this characteristic is an irregular and unreliable supply for the canals diverting from this shallow river section, which was the principal cause of the immediate or later abandonment of these canals for irrigation purposes during the period of 15 to 20 years following their construction. Another cause of this abandonment of canals was the semiarid climate in the Platte Valley and extending westward to Bridgeport, which permitted the growing of early maturing varieties of farm crops in most years with fair success.

(f) The recent expansion of sugar-beet culture demands a greater security of water supply for late irrigation which can be obtained only by means of supplemental storage or river-control works.

(g) Comparatively large areas may be reclaimed by drainage in units of great diversity of sizes and conditions. These drainage projects, if successfully developed, will bring about a corresponding addition to the productive agricultural area together with an annual saving of water supply, the amount saved for beneficial use being dependent largely upon the control which may be made possible by supplemental storage works.

(h) The various water-supply studies, as well as surveys of irrigation conditions which have been heretofore made and recently completed by the coopera-

tive study between the United States and the State of Wyoming, indicate that any further expansion of irrigation will require the construction of supplemental storage works, without which irrigation can not be successfully continued either in the Platte Valley, or in the lower reaches of the North Platte when the present abnormal river conditions shall be replaced by normal operating conditions upon the completion of the Fort Laramie unit. These studies show further that the security of irrigation of the lower portions can not be promoted to any appreciable extent by further release from the Pathfinder Reservoir or the withholding of irrigation from such Wyoming lands as may be put under irrigation within feasible construction costs.

(i) The blind reliance upon increase of return flow to meet the future requirements of irrigation in the lower North Platte and the upper Platte Valleys should be discouraged, or, at least, conditions should be carefully investigated by those given to this line of thought. Although it is true that probably one-third or more of the water applied to the lands by irrigation is returned to the river through surface and underground wastes and percolation, about one-half of this return flow occurs during the nonirrigation months. During the irrigation season a portion of this return flow is intercepted by intervening canals and a large portion is consumed by evaporation and percolation in the wide shallow channel of the Platte River during hot spells when irrigation needs are most pressing.

CONCLUSIONS.

From the foregoing the following general conclusions are suggested:

First, the gradual return to normal river operating conditions, together with the constant increasing expansion of irrigation in the lower portions of the North Platte River and the Platte River Valley, all point to the necessity of making an immediate and careful study of methods and plans of work which will ward off possible disaster and serious setback to the agricultural interests of these valleys.

Second, such an investigation should be comprehensive and should include irrigation, drainage, and power development, because irrigation and drainage are inseparably related and power development will probably prove sufficiently attractive in connection with these problems to make possible the financing of a number of these units which would otherwise

prove infeasible because of excessive construction cost.

Third, the close relation and the large extent of interests represented deserve both State and Federal aid so far as such may be offered within existing or potential legislative authority and financial resources.

DISCUSSION.

Immediately following the passage of the Reclamation Act, June 17, 1902, the Reclamation Service, which was at once organized, made an extensive search for feasible projects wherever conditions gave any reasonable promise of results. The North Platte Valley offered an inviting field. The earliest explorations were made within the State of Wyoming because the demands for development seemed to be most pressing in that section. The Sweetwater Reservoir and the basin below were first explored with discouraging results. Immediately thereafter the Pathfinder Reservoir was surveyed and its construction authorized in 1904. Reconnaissance surveys extending from Alcova easterly were immediately undertaken and proceeded, partly even in advance of the reservoir surveys, in the Goshen Hole portion of the valley. These project reconnaissance surveys were made during 1903-04. The results were reviewed by consulting boards who reported in favor of the building of the Interstate unit as a first venture, as it appeared most economical of construction as well as most inviting for settlement conditions.

At that time, the total area within the North Platte Valley under irrigation farming covered approximately 50,000 acres. Even with this restricted farm area, it was appreciated that little further extension of irrigation, especially to supply late maturing crops, could be made without storage and river control. This led to the building of the Pathfinder Reservoir to its full capacity, even though the use of that capacity was not at that time assignable. This conclusion was strongly supported by the beet-sugar interests who encouraged the growing of beets immediately after farming developed in the valley during the years 1905-1910. At that time, the sugar beets were transported to the nearest factories located at Sterling, Brush, and Fort Morgan, Colo. The results were so gratifying that the company encouraged the extension of the industry and started the building of sugar factories, of which there are now four in operation and an additional one in course of construction.

During the earlier years of the operation of the Pathfinder Reservoir, 1909 to 1913, it was impracticable to store water over winter. The construction of the Pathfinder Dike, auxiliary to the masonry dam, together with the building of supplemental works to regulate the outflow, prevented the use of the reservoir except during irrigation months. The benefits of the regulation of the river were so pronounced, how-

ever, that the older canals west of Bridgeport, which had been built in the early nineties, or earlier, united in a petition to the Secretary of the Interior asking permission to purchase a supplemental reservoir supply to insure themselves against shortage during the latter part of the irrigation season,* so as to enable them to grow beets, potatoes, and other late maturing crops. The Secretary granted the request on condition that application be made by those desiring to avail themselves of this privilege on or before December 31, 1912. Nearly all private canals between the Wyoming-Nebraska State line and Bridgeport, Nebr., including the Beerline Canal near Broadwater, Nebr., availed themselves of this opportunity and purchased supplemental storage to the aggregate amount of \$929,560.

While these purchases were being consummated, pressure was being exerted for the extension of the North Platte project by the building of additional units on the south side of the river. The Army Board, which had made an extensive investigation of all projects during the summer of 1910, had expressed itself adversely to the building of the Goshen Hole High Line Canal, but favored the construction of the Fort Laramie unit, provided water-supply studies showed that sufficient water was available for these lands. This led to the irrigation survey in 1911-12, usually referred to as the "Smith Survey and Report." It was made to determine the actual irrigable area available under each canal east of the Wyoming-Nebraska State line extending to the city of North Platte. A complete classification was made of the lands under each canal, whether irrigable or irrigated, and if not irrigated, the reason for such condition.

The foregoing study was supplemented by the so-called Diemer report in March, 1915. This report represents an intensive detail study of the available water supply, based upon the results of the Smith survey as to available lands under ditches and upon existing river records as gathered from 1902 to that time. The result of this latter study was the conclusion that beside the supplemental supply sold to the private ditches in 1912, water was available for 100,000 acres additional land, plus approximately 15,000 or 20,000 acres for which it was estimated a sufficient return flow would become available to insure full irrigation. This conclusion resulted in the approval of the construction of the Fort Laramie unit, estimated to embrace approximately 100,000 acres to the divide between the Gering and Creighton Valleys.

During the latter part of the season of 1918 an extensive investigation was made of possible secondary project developments throughout the reclamation States. On the North Platte project a reconnaissance survey of possible drainage projects was made as well as of supplemental storage. Borings were made to determine ground-water conditions of the entire

North Platte Valley from the Wyoming-Nebraska State line to the city of North Platte and some distance beyond. From this study it appeared that this portion of the river valley contained approximately 172,000 acres of land which could be distinctly benefited by drainage, but the lands so affected were distributed along the entire river in parcels of varying sizes from a few thousand acres to about 35,000 acres or more. It was also predicted in the report compiled from this survey that a material saving of water would result from such drainage augmenting the supply in the lower portion of the river materially. It was further concluded that reclamation could be profitably extended into the Platte Valley by means of a combination of irrigation and drainage facilities, provided also means were found for storing and controlling a portion of the large annual wastes passing the city of North Platte, of 1,000,000 acre-feet or more, and that means for such control would probably be found and profitably developed provided the public could be brought to an appreciation of the benefits of such undertakings.

While development was thus proceeding in the valley east of Pathfinder Reservoir, numerous Carey Act selections were being promoted along the North Platte River above Pathfinder, principally in the valley between Saratoga and Encampment, Wyo. It appeared, however, that the security of the water rights which had been initiated in the lower portion of the river demanded that later diversions farther upstream, especially for large units, should be undertaken only after most careful study. This procedure resulted in some difference of opinion between the State authorities of Wyoming in executive charge of water administration in that State and the Reclamation Service of the Federal Government. The State officials contended that the withholding of rights of way, together with the occasional adverse reports of the Carey Act engineer representing the United States Land Office, worked unnecessary hardship on well-meaning promoters and capable investors and irrigators and interfered with the development of the State. With the view of bringing about a better understanding and a satisfactory conclusion of this condition the Wyoming Legislature authorized a joint survey and the expenditure of \$4,000 on the part of the State of Wyoming, provided the Secretary of the Interior would meet this with an equal amount in behalf of the Reclamation Service. This authority was given and a contract was entered into for this purpose by the Secretary of the Interior and the Governor of the State of Wyoming under date of January 15, 1918.

In pursuance of this contract an investigation was made of the possibility and feasibility of future reclamation of arid lands in the North Platte Valley. The surveys and investigations were made jointly by an engineer of the Reclamation Service and one

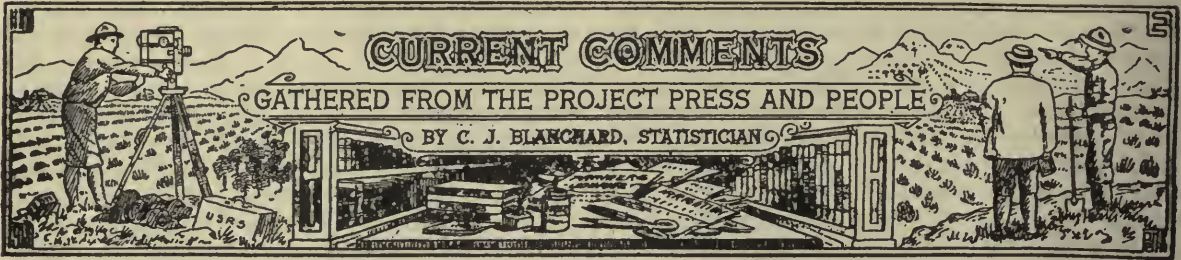
representing the State of Wyoming. The men selected for this survey were Harold Conkling, of the Reclamation Service, and R. I. Meeker, representing the State of Wyoming. The results of their work are given in a report of two volumes embodying an extensive study of all the river records obtainable to that date, together with the findings of all previous investigations of seepage, return flow, irrigation, and drainage, as well as the possible future developments which were deemed feasible within existing construction costs. This report presents the most complete and up-to-date study of irrigation conditions of the entire valley to and inclusive of the year 1918.

This contract between the Secretary of the Interior and the State of Wyoming provided further for a review of the above joint report by a board of three experts, one representing the State of Wyoming, one the Reclamation Service, and the third an engineer chosen by these two to cooperate as a disinterested counselor. The operations of the review board, composed of Frank C. Emerson, State engineer of Wyoming; E. A. Moritz, engineer, United States Reclamation Service; and L. G. Carpenter, consulting engineer of Denver, Colo., were completed in September, 1920, and their conclusions probably will be available for public information in the near future.

The physical condition of the river east of Bridgeport, Nebr., and especially east of North Platte, Nebr., is such that any further releases from Pathfinder Reservoir could at best produce little benefit to that section. Any waters so released can reach the head-gates of canals for which it is intended only when favorable climatic conditions prevail. It is wholly uncertain during periods of drought or local hot spells, because during such times the evaporation from the river may reach as high as one-half inch per 24 hours, which would consume from 2,000 to 2,500 second-feet from the State line eastward. Conversely, a recurrence of normal or damp weather conditions causes a reappearance of the river flow in a manner apparently little affected by contributions upstream. This sensitive river condition points to the necessity of building supplemental works in the lower Platte Valley such as will overcome these present unavoidable wastes by means of carriage in more confined artificial channels and storage in suitable inland basins for which measures nature seems to have provided opportunities.

From the foregoing, it may be seen that the problems of river control and water supply on the North Platte River have been given continuous, and at times, intensive study. Further search, such as must be based upon additional data to be gathered from field surveys, is necessary to outline feasible plans to safeguard the continuity and profitable development of irrigation farming in the lower reaches of the North Platte and in the Platte River Valley. This develop-

(Continued on page 6.)



DURING the period of war prices for farm products tenantry on many of our projects greatly increased. Lands adapted to growing cotton, sugar beets, and several special crops were leased at prices running as high as \$60 cash per acre annually. The owner who could rent his land at \$30 to \$50 per acre simply moved out, came to town, or started with the family for a trip to California. Now that the cotton market is dull and the prices of other crops back to prewar levels, the tenant is stuck and in many cases flat broke. He is going to quit, and the owner must get back on the job. No one who cares for the future of the farming communities where this is happening is going to grieve very much over this condition. The tenant as a rule was interested only in the year's crop. He cared nothing about the permanent development of the country because he owned nothing in it and contributed nothing toward its progress. He was a stranger sojourning for a brief while in the community and interested solely in getting all he could out of it.

The growth of tenantry on our projects during the past four years was great enough to warrant attention, but it was not wholly due to war conditions. Tenantry existed before the war. There is no remedy which will entirely cure the evil. Farmers who are successful and amass comfortable bank accounts can not be prevented from leasing their land and taking a rest.

The spread of a cooperative movement among the farmers in producing and marketing farm products renders the farmer's job less hazardous, and therefore more attractive. Cooperation also increases the

The North Platte Valley.

(Continued from page 5.)

ment has resulted from an artificial river condition caused by the release during recent years of stored water not required by lands entitled to stored water, on account of temporary excess storage capacity, a condition which must disappear as soon as the demands of the Fort Laramie unit become operative. It would be very unfortunate to drift heedlessly into the condition of river shortage which will then result and thereby experience such serious losses as will cause a setback to the valley from which it may recover but very slowly.

opportunities for the more progressive farmers to broaden the field of their activities, brings them into the stimulating currents of business life, and by so doing fixes them more strongly to the soil and their farm home.

For a quarter of a century we have had dinned into our ears the fact that the tenant farmer is hastening the decay of rural life in the United States, and New England has been held up to our view as the "horrible example." More recently Pennsylvania and some other States have been placed in the same category. The statistics on tenantry are really disturbing. In 1880 only 25.6 per cent of our farms were operated by tenants. In 1910 the percentage had increased to 37, and prediction is now made that within 30 years 50 per cent of our farms will be occupied by renters. This is a threat to the solidarity of our farming communities which a wise nation can not afford to overlook. Tenantry increases rapidly with the increase in land values, and obviously the higher the price of land the less chance the farm operator has to become an owner of it. If his rent is high, the tenant becomes a soil robber, and having filched all the goodness he can from the land, moves on to another farm. He rarely owns live stock, so in his case his operations are like that of a miner who takes out everything of value and puts nothing back. Australia, New Zealand, Canada, and in this country the State of California are meeting the problem by furnishing opportunities and money to those who are worthy and desire to make homes on the land. A half million men who fought for the principles of democracy are waiting and watching for some action on the part of the Government* in this direction. As many more from all the walks of life are just as eager to accept similar opportunity.

We have the land, the soil, the climate, and the men; now, will our statesmen lay the plans for bringing them together?

The use of Mexican labor on a number of Reclamation projects last year afforded great relief during harvest time. On those projects where the acreage in cotton and beets is large this labor proved quite satisfactory. Our southwestern projects, the Rio Grande, Carlsbad, Salt River, and Yuma, have long been accustomed to the Mexican as a farm worker, and familiarity with his language and methods en-

ables the American farmer to use him to the best advantage. For several years an increase in the movement of Mexican laborers into more northern fields has been noted. Last summer and fall we found many of them in Idaho and Montana, principally in the beet fields.

As long as the present shortage in American farm laborers exists this demand for the Spanish-speaking workman is likely to continue and grow. Under proper supervision and direction by men who understand him and his limitations he usually proves a good laborer. An understanding of his language is always a great help in getting the best work out of him. It would seem, therefore, wise on the part of employers who expect to utilize this labor next season to devote some attention to a study of Spanish this winter. The vocabulary of the average Mexican laborer is said not to exceed 500 words, so that a course in conversational Spanish covering the phrases most commonly employed in farm management would not call for very great effort on the part of project farmers. Our suggestion is that classes in Spanish be organized at once for winter evenings on those projects where Mexicans are likely to be employed in 1921. Children should be admitted to these classes, as they usually pick up the language more readily than grown-ups, and they can act as interpreters when needed.

More thought should be given to the housing of this class of labor. Most of our Mexican laborers move with their families, and they are likely to be more permanent and contented if decent accommodations are provided for them. On several projects last season we found them located in miserable shacks and tents without sanitation or domestic conveniences of any kind. Neglect of this sort results in discontent, poor health, and lessened ability to do good work.

On those projects where Mexican labor is wanted permanently our suggestion is that simple but comfortable houses should be furnished and a small plot of ground be prepared for the laborer's garden. The Mexican has a fondness for certain kinds of vegetables, which are largely used by him for food, and he and his family will usually find time to take care of the garden after the regular day's work is concluded. On several of the projects arrangements could be made to lease tracts of land convenient to the farms or towns. These tracts could be subdivided in lots for laborers, and with inexpensive cottages erected on them, water and sewers, the laborer and his family would be contented and happy. Many would remain throughout the year if employment were available on the roads and in other lines.

The economic waste in sections which depend largely upon nomadic labor is enormous. This is especially true in all communities where farms are large and one crop is the rule. Reclamation projects as a rule do not fall into this class. There is a pe-

riod, however, on some of them where a peak labor demand occurs, as on those which crop large areas in beets and in orchard products. The problem of harvesting these crops can not be solved entirely by utilizing the local supply, but it can be alleviated in some measure by making more permanent a larger percentage of the labor which is now mostly transient. A great deal of the work in the beet fields and in picking fruit can be done by the families, even the children finding occupation of various kinds. Given comfortable houses and winter employment for the men many of these families might be induced to remain the year round.

Sugar beets will probably show up this year as about the most profitable of the crops grown on our projects. The growers were guaranteed a good price before planting, and therefore are not suffering from the slump which hit almost every other farm crop. There is nothing as yet to indicate that the sugar companies will seek to reduce the acreage in beets next season, but the guaranteed price to growers may be less than for the past year. As an offset to the farmer, labor is likely to be cheaper and more efficient.

At the time when most farmers were ready to sell their crops the market showed weakness which finally developed into a pronounced slump. Simultaneously came the calling in of farm loans and a reported stringency in money, so that the farmer found himself in a tight fix. Many who were willing to sell and forget profits found cars lacking and few buyers. Conditions could hardly have been worse. For a time it looked as if the farmer alone was being made the goat, but later it was seen that all lines of industry and commerce were going through the same readjustment. Manufacturers began to complain of cancellation of orders. Retailers howled about full stocks and no customers. Then all down the line prices began to tumble until to-day a bushel of wheat at \$1.50 has an exchange value in most commodities about equal to the \$2 wheat of war times. There is nothing else to do now but face the situation bravely. We are in a period of readjustment which is going to continue until the normal prewar order of things is back again. Meanwhile our statesmen are thrashing out the problem of devising a system of reasonable financial credit for the farmer when he most needs it.

It may not comfort the farmer whose balance this year is in the red to know that business generally is being done on a mighty close margin with a lot of merchant's taking a loss, but, gee, its cheering to the consumer all right. Now if we can get the landlord and the coal man to be reasonable, life once more will almost be worth living.

NOTED HERE AND THERE.

Arizona, Salt River project.—Farmers unable to sell their Pima cotton for a remunerative price are generally looking toward grain and alfalfa for their next year's crops. In this they are being assisted by local grain dealers, who have offered seed on credit at the request of the Salt River Valley Water Users' Association. It is probable that not more than 100,000 acres of cotton will be cropped in the valley next season, this to be compared with 186,000 acres this season.

Arizona, Yuma project.—Washington, D. C., contains to-day about 25 more live boosters for Yuma Mesa than it did a short time ago, and they are all in the Reclamation Service office. The arrival by express of a box of oranges and grapefruit from the miracle four-year-old Hill orchard on the mesa converted everyone of the force fortunate enough to sample the golden globes from America's Valley of the Nile. While we do not anticipate a sudden and heavy exodus of the force to Yuma's "Beloved Mesa," we are sure from now on that the interest of the Washington office in the development of that wonderful valley will be keen and that words of praise will not be lacking when that region is discussed in the future.

We extend to Mr. Hill, the grower of the fruit, and to Col. B. F. Fly, by whose thoughtful suggestion we know it was sent, our sincere thanks.

One box of Yuma oranges has been on display in the window of a prominent store here for several days, bearing the legend "This fruit was picked from four-year-old trees grown on the Mesa at Yuma, Arizona, where the U. S. Reclamation Service is selling orchard tracts with water at \$225 per acre."

California, Orland project.—John Button, who is one of the newer of the Orland purebred Jersey cattle breeders of the Orland Jersey belt, made a shipment of a fine yearling bull to one of the fanciers of gilt-edge cattle in the southern part of the State. The animal is a son of Mascot's Raleigh and was bred at Shelbyville, Ky., and is a grandson of Virginia's Raleigh, the famous bull owned at the State experiment station of Kentucky. Mr. Button has not stated the amount received from the youngster, but says that the two calves obtained from the mother of the bull have more than paid for the dam, one of the finest of the purebred dams in this county. Mr. Button started in on a small scale, just one small cow of the accepted type, but he is rapidly building up a herd that will bring his name into prominence among the owners of cattle of this section of the State.

Figs, of both the Smyrna and Kadota varieties are to be planted in large amount the coming season, according to nurserymen who are supplying the young trees. There has never been a season in which so much interest has been taken in this variety of fruit, and the local growers of stock are beginning to worry lest the supply fall short of the demand.

Grapes are now seemingly destined to be the predominant planting in the fruit line the coming winter.

Colorado, Grand Valley project.—The T. G. Twyman herd of purebred Poland China hogs, raised on the Twyman ranch on Orchard mesa, is famous the country over for the excellence of their breeding, and they are in demand among breeders. Mr. Twyman recently loaded for shipment to C. P. Collins of Windsor, Conn., the third shipment of these purebred hogs, the two previous shipments having gone out during

the past two months. In the last shipment there were three gilts and a young boar, all bred and raised on the Twyman ranch.

Mr. Collins is a noted breeder of Poland Chinas in the East and is purchasing from the Twyman herd in order to bring new blood and vigor into his herd.

Mr. Twyman also shipped out a 6-months-old boar to P. H. Wilkinson of Antonito, Colo., and shipments to points in this State and over the West in general are of frequent occurrence.

A little story showing the results that may be obtained in many lines of agricultural activity is told us by George E. Rowe, of the Rosedale ranch. Last spring early he was planting an acre of soil in good condition to potatoes; there were 21 rows in the patch and he lacked enough seed to plant one row, so he got out some honey-dew melon seed which he had saved from the year before and planted it thick in that row—not in hills but every few inches. He sold to D. B. Bailey 1,400 of those melons, 300 to other grocers and enough more to Colorado Springs to make a total sale of 2,000 melons. He received \$15 a hundred for those sold locally and 32 cents each for those shipped, and for the entire lot he received at least \$300. He gave away a good many and has at least 100 more in store.

Seven thousand boxes of choice McIntosh apples and 1,000 boxes of winter apples bearing the stamp of J. E. Hauf & Sons will reach the New York consumer this year, shipped there by the University Heights Orchard Co., to which the crop has been sold. The size, color, and flavor of the Macs this year and the production exceed that of any year previous, according to the grower, who stated that the 8,000 boxes came from an orchard covering no more than 20 acres.

From 97 trees, 1,000 boxes of Macs were picked, and the production reached from 22 boxes to 5 boxes to the tree. The average price received for each box is \$2, but out of that must come the cost of a box and wrapping paper, the price of picking, 5 cents, and packing, 8 cents, or 14 cents, according to pack, and the cost of transportation to Woodside.

The bushel of wheat from the farm of J. J. Skinner, of Fruita, took second prize at the great grain exhibit at Chicago. It was second only to a bushel grown by John Howell, of Montrose, so that the western slope of Colorado can brag over the fact that in two counties it has the best red winter wheat in the United States and the Dominion of Canada. There was very little difference between the Howell and Skinner bushels.

The vegetable flour mill at Delta is running right along on pumpkin flour. It is some interesting sight to see the pumpkins delivered to the washing tanks, cut up, conveyed to the cooker, thence to the flaker and into the grinder, where they are pulverized, then transferred to the bolter and separated, the finished product being carried to a large bin, when it is ready to be sacked.

Idaho, Boise project.—One field of 10 acres in Canyon County yielded 639.5 bushels per acre of marketable potatoes. These were sold for seed and averaged close to \$1,000 per acre.

Idaho, Minidoka project.—Paul appears to have a full quota of intelligent, progressive farmers, as evinced by the harvest taken from Edw. Fulkerson's

farm, one of the pioneers who homesteaded during the first days of the project. A total valuation of his crops raised this year is placed at \$5,132. This is the return from 50 acres of hay ground, producing 200 tons; 8 acres of barley, from which 320 bushels were thrashed; 1,120 bushels of wheat from 28 acres; and 2 acres of potatoes, yielding 600 bushels. Included in that amount also are 28 acres of pasture land valued at \$30 per acre, on which 20 cattle, 3 of them dairy stock, are pastured.

George S. Wignall, south of Rupert, finds it pays to plant certified seed potatoes, as he harvested a yield of 50 to 75 sacks per acre more than on ground planted to local seed. His yield of Whites averaged 300 per acre, and on other varieties from 200 to 250 sacks per acre.

Harley E. Vietor, farming a tract near the dam, raised 2,400 bushels of potatoes from 6 acres, an average of 400 bushels. His hay crop averaged 4 tons per acre and corn was reported to produce 40 bushels.

Analysis of the crop situation in the Northwest shows the Minidoka project to be in excellent condition. The South Side Minidoka project grew a large proportion of sugar beets and potatoes this year. These are cash crops, and the farmers were able to turn them to advantage as compared with hay and grain.

Our farmers were favored by having located in Burley a factory for the conversion of alfalfa hay into various ground products. These alfalfa products do not suffer as does the hay because of the quarantine regulations of the various States near by, but are allowed to enter and find a ready market in practically every State in the Union.

The Burley Feed Manufacturing Co. shipped out this season nearly half a million dollars' worth of mill feeds in which alfalfa is an important ingredient. The demand for the products is heavy and the price was such as to hold the price of alfalfa hay several dollars above the market in other near-by counties. The Feed Co. was handicapped in its operations for a time through not being able to secure dry hay, but with fairer weather this difficulty was removed. Burley and the surrounding country are in comparatively good condition to meet the readjustment now taking place, and are certain to come through in good shape, because of these favorable circumstances.

Montana, Flathead (Indian) project.—The valley's crop of spuds last year was a bumper one. Storage warehouses were taxed to capacity limits, and a continuous line of cars rolled out the valley carrying the best crop ever raised to outside markets. "Flathead Aristocrats," the name given the big baking variety, will grace the tables of the Great Northern Railway's dining cars. Each weighs over 14 ounces.

In addition to the big stores of potatoes shipped out, many carloads of apples, plums, and prunes and 30,000 pounds of cabbages were sent to outside markets.

New Mexico-Texas, Rio Grande project.—The sweet potato is becoming one of the stand-bys of the valley farmer and several big yields are reported. J. W. Newberry reports 12,000 pounds to the acre, selling at 4 cents per pound, netting \$480 to the acre. Another farmer has raised the past season more than 100,000 pounds and received in the beginning of the season considerably more than 4 cents per pound. Cooperative marketing under the direction of the farm bureau ultimately may raise this product into the first-class crops of the valley.

Oregon, Umatilla project.—For the second year in succession George Strohm has taken the first prize on

the best carload of fat hogs and has put Hermiston on the map again before the entire Pacific Northwest.

Hermiston's live stock industry has been in the front at every show where her stock has appeared this season, and Mr. Strohm's last prize is the grand climax to a wonderful year and record for our stock.

There is not a spot under the sun better fitted for the raising of live stock than the Umatilla project, and that fact has been advertised all over the country this year through the wonderful showing of their stock. With plenty of hay, plenty of sunshine, and plenty of good water, and ideal weather, what more can be desired for the raising of live stock?

Last year in the same show Mr. Strohm won the same prize, and the hogs sold for the market's top price.

Washington, Yakima project.—About 1,100 cars is the estimate made by H. A. Glen of the Northern Pacific on the size of the Yakima Valley grain crop. This is believed to be a 25 per cent increase over last year's crop when 830 cars were grown and shipped. The crop for 1918 was about 700 cars.

The 1920 hop crop of the Yakima Valley is worth, at the average contract prices, between \$1,980,000 and \$2,070,000.

The hop crop of the Yakima Valley for this season is between 22,000 and 23,000 bales. Each bale contains 200 pounds, making the output in pounds between 4,400,000 and 4,600,000 pounds. Though some hops were sold at prices between 65 and 75 cents a pound, the average price per pound is 45 cents, making the total value of the season's crop between \$1,980,000 and \$2,070,000. Some of the growers had long-time contracts and were compelled to sell most of their crop at figures far below this season's values.

L. W. Chamberlain of the Sunnyside district claims the prize crop of sugar beets in a yield of 1,010 tons harvested from a field of 50 acres. Of this amount of ground 40 acres was good beet ground and 10 acres poor soil. The average yield was over 20 tons to the acre and individual acres must have produced much more than that amount. According to Charles Reese, who has checked on the production the best fields in the Sunnyside district are running from 18 to 20 tons to the acre and the sugar contents is as high as 18 per cent in some instances. Mr. Chamberlain's check in payment for his crop was \$12,120. Mr. Chamberlain has for several years been the prize beet grower in the lower valley.—C. J. B.

INDEX TO RECLAMATION RECORD, 1920.

The index to the RECLAMATION RECORD for 1920 is now in the hands of the printer and should be available shortly for distribution.

Water users are again reminded that in order to get the full benefit of the RECORD they should preserve and bind the copies received during the year. The index, which will be sent on request, should prove helpful in locating that special article which you remember having read, but which you are otherwise unable to turn to at the time it is most needed.

Requests for copies of the index should be addressed to the Chief Clerk, U. S. Reclamation Service, Washington, D. C.

THE BOARDMAN COMMUNITY SCHOOL, UMATILLA PROJECT, OREG.

By Prof. M. B. Signs, Principal.

THE development of the Boardman Community School in the short term of three years, from a little one-room shack with six pupils, to the modern building herewith represented, naturally makes the hundred pupils now attending enjoy their work, and the people of the community proud of their accomplishment. Boardman is situated on the Columbia River and highway, in the heart of the West Extension of the Umatilla irrigation project, north Morrow County, Oreg. Surrounding this region is the great John Day Irrigation District offering 300,000 acres yet to be developed. Naturally the people thought of the future with optimism, and planned for it in their

schools. An architect, E. F. Williams, of Portland, was employed and the unit plan of construction began. The center unit was first finished and used a year when the two wings were added. The building is equipped with its own water system, pumped from an artesian well into a 1,000-gallon pressure tank, from which it is distributed throughout the building, and at present the town is being tided over a crisis by securing water from the school system. The plumbing consists of individual urinals of white porcelain, vitroware reverse trap wash down bowl, porcelain lavatories, pedestal white enamel drinking fountains, and white enamel sinks. The building is equipped with five sets of fire hose and reels.

BOARDMAN COMMUNITY SCHOOL

UMATILLA PROJECT
OREGON

1. AS IT WAS 2. AS IT IS 3. AS IT WILL BE



The sewage is disposed of by use of a septic tank, and the building is heated by means of a low-pressure direct-indirect system with an auxiliary fresh air supply.

Electric service is obtained by a 4-k. w., 110-volt generator, which is supplied by an 8-horse, 4-cycle, 4-cylinder gas engine, with self-starter and stopping device. There is a storage battery of 56 cells to supply current when the machine is not in operation. The building is lighted throughout with this service, and connections are placed for power for sewing machines, electric irons, cooking utensils, and motion pictures.

On the main floor are the class rooms, office, and library of 3,000 volumes. The auditorium is in the central portion on the second story. The basement is divided into two distinct departments, the boys on one side and the girls on the other. Provision is made for sewing, cooking, dining, science, and manual training.

The grounds comprise 10 acres and afford opportunity for spacious lawns, a school garden, and play grounds; and when fully developed a complete athletic field.

The primary function of the public schools is to make good citizens. From the standpoint of citizenship every schoolhouse ought to be a polling place. This would not only be economical but would emphasize the ideal for which the ballot box stands. We have tried this plan in Boardman and the school is the voting place. Last primary election was the last day of school. We held our election, observed the closing exercises of the school year, had a speaker on political economy from the State university, and a community dinner—a real time of good fellowship for the people of the community, young and old. In addition to the use of the school as a polling place, all the various organizations of the community use the building and its equipment for their activities: the Ladies' Aid Society, the Grange, the Farm Bureau, Parent-Teachers' Association, Commercial Club, Community Library, Hay Growers' Association, the North Morrow County Fair Association, and Extension Schools. About the only organization in the community that does not use the school is the church, and there is some discussion of bringing that in line where the school auditorium and class rooms and equipment might be used for religious instruction, while the small cottage church could be remodeled for a manse.

The next important step in the development of the community-center idea would be the federation of the above-mentioned organizations under a community-paid secretary with a board of directors composed of the heads of each department. Community work could then be carried on with a definite plan for all and move steadily forward in accomplishment of civic needs and betterments.

PREVENTION WILL CUT FARM ANIMAL LOSS BY MILLIONS.

By Dr. John R. Mohler, Chief of the Bureau of Animal Industry, United States Department of Agriculture.

LOSSES of farm animals on reclamation projects due to disease, accident, and other causes are much greater than they need be, considering the advancement in veterinary medical education and the numerous effective methods developed by science for offense and defense against animal disease.



These healthy animals have helped to make their owner a prosperous water user.

The direct loss amounts to many millions of dollars a year, and the indirect monetary losses defy calculation, but it is certain that they are much larger than the direct losses. The direct and indirect losses no doubt discourage the stock-raising industry to a large extent, and this, in turn, retards development of diversified agriculture and materially affects the cost of living.

The maladies which afflict animals are about as numerous and varied as those to which mankind is subject; but comparatively few animal diseases are sufficiently widespread to be of great economic importance.

FIVE PRINCIPAL CAUSES.

Deaths or injuries of farm animals can be traced to five principal sources: Contagious diseases, sporadic diseases, parasitic troubles, accidents, and neglect. Waste is the only word which can be applied to this condition, because the greater part of the present losses can be prevented. Of course, the communicable diseases are responsible for the largest losses—in 1915 the proportion was estimated at about four-fifths of the total. This could be materially reduced if the owners would cooperate with the Bureau of Animal Industry of the United States Department of Agriculture, and with the live stock and sanitary

officials of the various States who have given much attention to the control and eradication of destructive animal diseases.

The sporadic and incidental diseases, such as disorders of the digestive and respiratory tracts and parasitic afflictions, cause substantial losses which could be avoided if the reclamation settlers would apply the available knowledge of feeding, housing, parasites, and sanitation.

Losses from accidents such as horn and tusk wounds, sprains, bruises, wire cuts, harness sores, and broken legs in many instances are due to neglect or carelessness. Probably three-fourths of the losses from animal disease and accidents are preventable.

PREVENTION MOST VALUABLE.

Prevention of disease is far more valuable than cure, and as a preliminary care should be taken in the selection of breeds adapted to the climatic and local conditions; also the selection of the foundation stock from herds free from disease.

Tuberculosis is the most destructive disease for which the purchaser must be alert in making selections. Through cooperation of the United States Department of Agriculture with State authorities, tests of both purebred and grade herds may be had at the owner's request. The plan is to develop a list of purebred herds from which breeding stock may be purchased with the assurance that it is free from tuberculosis.

It is noteworthy that losses on stock farms operated under reasonably sanitary conditions are slight in proportion to those on the average farm. The prevalence of tuberculosis and its rapid spread in communities where large numbers of animals are confined in dark, damp, poorly ventilated buildings, especially of the bank-barn type, and the nonprevalence of this disease in animals roaming at large, illustrate the importance of constructing barns so the animals may have abundant natural light and pure air.

DAMPNESS A MENACE.

The surroundings should be in keeping with the interior of the barn. Dry barnyards, dry exercising paddocks and feed lots, with concrete feeding platforms properly sloped and drained, are important precautions against the losses from infections which lurk in damp earth and mudholes.

Modern methods of transportation of animals by rail create ideal conditions for the spread of parasitic and infectious diseases. The reduction of vitality of the animals in transit exposes them to contagion. Such conditions also account in large measure for the prevalence of tuberculosis, hemorrhagic septicemia, influenza, hog cholera, scabies, and other communi-

cable diseases against which the farm herds must be protected.

Within the last 25 years science has placed in the hands of stockmen effective methods for protecting the health of animals. The germ theory has been demonstrated and developed and some of the processes and substances used by nature to combat transmissible diseases have been made available for prevention and cure. Among the substances which are giving the best results are those used for diagnosing tuberculosis, glanders, and dourine, and the serums, vaccines, and bacterins. The losses from blackleg have been reduced from 4 per cent to one-half of 1 per cent through the use of blackleg vaccines. Serums are used successfully in treating hog cholera, anthrax, calf scours, and tetanus, and the losses from joint-ill and hemorrhagic septicemia are materially reduced through the use of bacterins.

ISOLATION IS VITAL.

The importance of isolation and quarantine generally does not seem to be properly appreciated. As soon as an animal is suspected of being affected with any communicable disease, it should be separated from the healthy animals and held in quarantine until its condition has been determined and remedied, or disposition of the animal accomplished.

The proper handling of animals has an important bearing on maintaining their health and resistance to disease. Much of the success in keeping live stock well depends on proper feeding. Apart from communicable disease, the greatest losses can be traced to the diseases and conditions arising from some form of abuse of the stomachs and intestines of the animals. The proper balancing of rations has a material influence on the health of live stock. Enough of each food element is needed, and yet a superabundance of any is likely to result in digestive disorders, thus predisposing the animal to disease.

Sufficient protein is necessary both for maintenance of milk production in dairy cattle and proper growth in other farm animals. But an excess of protein is likely to put extra work on digestive organs and open the way for disease. Mineral material or ash is needed in proper proportions, if the animals are to continue to grow and remain in good health.

NEED BULK RATION.

The necessity of bulk in a ration is of more importance than many owners realize. Ruminants in particular can not digest their food unless it has proper bulk. Succulence is a feature in rations. Some feed, as, for example, cottonseed meal, when used in reasonable quantities for certain classes of animals, proves to be satisfactory and economical, but when fed in larger quantities or to other classes of animals, results in sickness or even death. Overfeeding, underfeeding, or feeding at improper intervals, affects

the general health of animals. Feeds containing excessive quantities of hard, dry, woody fiber, unless accompanied with some form of succulent forage, tend to produce constipation and even impaction of the stomach and intestines. Moldy feeds frequently produce forage poisoning. Excessive quantities of ergot in grain fed will produce gangrene of the feet, tail, and ears.

A stock grower can not be expected, of course, fully to keep informed of the rapid advances made in the studies of feeds and feeding, animal nutrition, veterinary medicine, hygiene, and other important matters relating to the industry; yet he can avail himself of the benefit of the studies and demonstrations of specialists who have devoted their entire time to these subjects.

Every State agricultural college maintains a corps of specialists whose publications and services are available. The Department of Agriculture is constantly giving out important information in books and bulletins which are available on request, and in every State it has representatives who are combating disease.

It is well to consult the local veterinarian in case of any disturbing symptoms and the State veterinarian also is ready to give advice and assistance in the diagnosis and control of contagious diseases. Losses could be minimized if stock growers would take advantage of these agencies.

It is a wise breeder who shapes his system to prevent disease instead of waiting until assistance is needed.

C. C. HOGUE RETIRES FROM GOVERNMENT SERVICE.

On October 1, 1920, Mr. C. C. Hogue resigned his position as senior clerk on the Klamath project. He had reached the age of 70 years, and was entitled to retire on an annuity under the retirement act of May 22, 1920, being the first employee of the Reclamation Service entitled to retire under this act.

Mr. Hogue came to Klamath Falls in June, 1905, and was associated with the Reclamation Service until his resignation. He served as chief clerk from November 1, 1905, to March 3, 1920.

Mr. Hogue has been active in local affairs. During the war he was a member, and later president, of the local Defense Committee. He was also a trustee of the local school board for many years, and has been elected a life elder of the Presbyterian Church. Mr. Hogue came to Oregon in 1878, and first located at Albany. He was paymaster of the Corvallis & Eastern Railroad during its construction. Later he was the manager of the Albany Light & Water Co. He was also manager and part owner of the Magnolia Flour Mills.



C. C. Hogue.

Mr. Hogue is a man of fine character, a loyal employee of the Reclamation Service, and a respected citizen in the community. He leaves Klamath Falls with the best wishes of his acquaintances and fellow workers. After an extended tour with Mrs. Hogue through Canada and the Eastern and Southern States, Mr. Hogue contemplates making his home in San Francisco.

DUCKS KEEP LATERAL CLEAN.

Mr. J. A. Latimer, of Delta, Colo., a water user on the Uncompahgre project, writes as follows:

About 18 years ago it was very sultry and hot and the moss grew worse that year than others. I had 89 ducks; they fed themselves and kept one-half mile of ditch entirely free from moss. I never had any trouble, while others could hardly keep water running.



Keep Brood Sows in Winter as Cheaply as Possible.

THE United States Department of Agriculture advises that during the winter the brood sows should be maintained as cheaply as possible, but at the same time they must be properly fed in order to farrow a large number of healthy, well-grown pigs in the spring. Best results are obtained when sufficient food is given to produce daily gains on the sows of one-half or three-fourths of a pound. To do this the grain feed must be limited, and diluted with some roughage, for unless the ration has sufficient bulk, the sows will become constipated and hungry, due to the undistended condition of the digestive tract. Legume hays are the chief roughages available at this season, and their use will cheapen the cost of feeding.

Either alfalfa, clover, soy-bean, or cowpea hay makes an excellent roughage, and when fed, little or no high-priced protein concentrate is needed to balance the corn. Bright, leafy alfalfa hay gives the best results of any of these roughages. Alfalfa meal is simply the best grade of alfalfa hay chopped into a meal. Clover hay contains almost as much nourishment as alfalfa hay, and soy-bean hay, cut and cured when the beans are almost ripe, is a very nutritious feed. Cowpea hay should be cut when the first peas are ripening and consequently does not have as high food value as soy-bean hay. Great care must be exercised in curing soy-bean and cowpea hay, for the stalks are very heavy and succulent and unless thoroughly dried are apt to mold. Under no condition should a brood sow be fed upon any roughage which is not bright, nutritious, and free from smut or mold. She does not relish or thrive on such inferior feed. It is very apt to cause severe digestive troubles and may lead to the loss of her litter.

What Part of the Farmer's Milk Check Represents Profit?

For 180 cows that averaged less than 5,000 pounds of milk annually, the part of the milk check that represented profit and reimbursement for the owner's managerial ability was 23 per cent. For 257 cows, averaging more than 6,000 pounds annually, the per

cent remaining for profit and the owner's skill was 41 per cent.

For the last five years the Dairy Division, United States Department of Agriculture, has been making studies which bear on this problem in many dairy sections of the country; and two-year investigations on the requirements for producing milk have now been completed on groups of dairy farms in six of these communities. One of the latest of these studies, carried on in Vermont, is the one on which the above figures are based. What it has disclosed in regard to economy of production and the requirements for producing milk, may be of value to the dairyman who is interested in finding out where milk returns are going.

These figures, which were obtained from a study of the production records of 587 cows which remained in the herds a full year, show that the average annual production of the 180 lower-producing cows was 4,146 pounds; also that the average production of 257 higher producers was 7,144 pounds a year. After subtracting from 4,146 pounds the amounts of milk required to pay production costs (feed, 1,810 pounds of milk; labor, 806 pounds of milk; and other costs, 570 pounds of milk) only 960 pounds of milk remained for the profit and skill of the owner. For the high-producing group, however, 3,074 pounds of milk remained after the following deductions had been made: For feed, 2,302 pounds of milk; labor, 806 pounds of milk; and other costs, 962 pounds of milk.

Here then were cows in the same locality, in some cases standing side by side, and all requiring about the same labor; yet some were producing three times as much profit as others, even though they were charged with greater quantities of feed and a large amount of "other costs."

The figures adduced are significant also in that they show that in milk checks size is not always a true measure of real value, but that the per cent of profit as determined by the cows that are kept plays an important part.

REQUIREMENTS FOR 100 POUNDS OF MILK.

The figures upon which this comparison is based were actual records of production; feed, labor, and

other costs were obtained by monthly full-day visits on each of the farms for a period of 2 years. Careful records were made on these visits of the daily milk production of each cow, feed consumed, labor required, overhead costs, etc. Using these data, the requirements for producing 100 pounds of milk were worked out. So far as possible the requirements were determined in terms of pounds of feed, hours of labor, etc., so that constantly fluctuating prices would have no effect on the value of the figures. Results may be interpreted at any time by using prevailing prices.

The requirements for producing 100 pounds of milk, based on 847 cows, with an average annual production of 5,252 pounds of 3.9 per cent milk, were as follows:

	Winter.	Summer.
Grain.....pounds..	33.1	8.7
Hay and other dry roughage.....do....	129.9	18.7
Silage and other succulent roughage.....do....	191.3	27.8
Hauling and grinding concentrates.....do....	\$0.020	\$0.005
Bedding.....pounds..	11.2	
Pasture.....acres..		0.10
Human labor.....hours..	2.7	2.0
Horse labor.....do....	0.6	0.4
Overhead and other costs.....	\$0.555	\$0.425
Credit for calves.....	¹ 0.025	¹ 0.009
Credit for manure.....pounds..	382	55

¹ Of a calf.

Good Time to Make Farm Inventory.

An annual property list or inventory is the only means whereby farmers may know accurately their net financial worth, what progress they are making from year to year, and how their investment in farm property is being distributed. Property lists, or inventories, made in accordance with a plan outlined in the Office of Farm Management, United States Department of Agriculture, are not difficult to make and are of great value to any farmer who is striving to better his condition, overcome obstacles to success, and place his business affairs on a secure foundation. To drift along year after year, not knowing whether toward success or failure, is not the practice of business men. Specialists of the department are prepared to give complete directions for making a farm inventory that will put the farm on a business basis.

The Treasury Department is committed to the continued sale of Government savings securities, and feels that as time goes on continuous sales of savings securities over the counter, at post offices, and banks throughout the country, should play an increasingly important part in the current financing of the Government.

A SUCCESSFUL WATER USER.

Farwell Morris, Former President Sunnyside Water Users' Association, Yakima Project, Wash.

EDITOR, RECLAMATION RECORD: At the suggestion of Director Davis I send you some irrigation experiences. An acre of 8-year-old Rome Beauty trees. I have irrigated once this past season. Several times I started to give them water, and found they didn't need it. The fruit was of fine size. One and one-half acres of Rome planted last spring received two waterings; my neighbors comment on their splendid growth.

All of this land has been in alfalfa but is now clean cultivated. It is 10 feet to ground water.

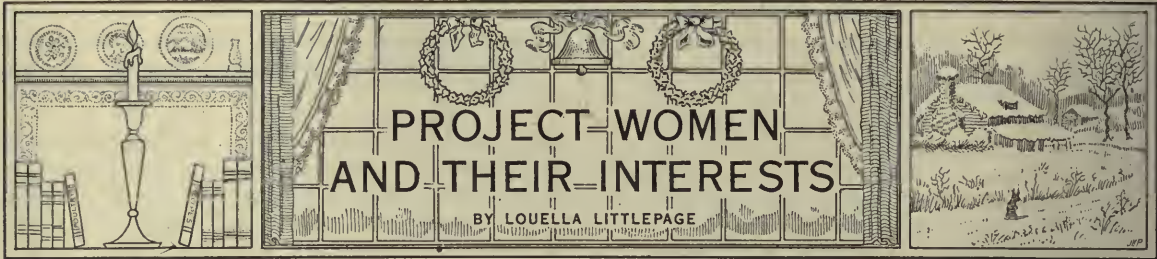


Farwell Morris.

Several years ago 2½ acres of Delicious and Winesap trees at the other end of the ranch, under similar conditions, went 3 years without water, with equally satisfactory results. As often as it seemed to me that the land needed water, I got Mr. Waterbury, who was then under Mr. Janes, irrigation expert from the Department of Agriculture, Washington, D. C. Always the soil augur showed available moisture to a depth of 5 feet. I then planted alfalfa between those trees, which I have just had plowed again. I find that my lava-ash soil, with plenty of humus under a dust mulch, is very retentive of moisture.

FARWELL MORRIS.

Presidents of women's organizations have emphasized the need of the continuation of the Treasury Savings work among their membership in 1921.



A VERY profound article recently passed over my desk under the caption "Rural Situation and Outlook." It contained an appalling array of facts showing the ever-increasing movement of population from the country to the city. In speaking of the abandonment of farms in New England it stated that Massachusetts had three times as much land in cultivation 100 years ago as now, and that 92.8 per cent of its population dwell in cities. It stated that the disproportion between New York's total population of more than 10,000,000 and the number of people directly engaged in agricultural production (about 380,000) is most disturbing.

We have been brought up to believe that the farm home is the corner stone of American democracy, but with the girls and boys migrating to the city as soon as they can get away from home the corner stone shows a tendency to crumble.

A summation of the situation goes on to prove how city conditions best meet the deepest instinct of the human heart—the craving for happiness. Let the matter be considered from the standpoint of human development on any side—physical, financial, mental, social, spiritual—and this will be found to be the case. Take the physical standpoint for instance: We always consider the country as healthful, yet the draft rejected a larger percentage of country boys on account of physical disability than city boys. Also, the most common of fatal diseases are more prevalent in the country. Typhoid fever is largely due to the house fly and bad water; malaria to mosquitoes; intestinal diseases to badly balanced rations; lung trouble to closed sleeping rooms and uneven temperature. Infant mortality and childbirth fatalities are largely due to lack of good medical facilities, as also are troubles arising from bad teeth and ear and eye troubles.

School facilities are as a rule superior in the cities, and there are the libraries, music, art, and all kinds of amusements. It all comes to this—a man or woman can make more money in the city, work shorter hours, live more comfortably, and drink more deeply of the cup of human happiness.

These conditions are all wrong, and the new year is a splendid time for every farm woman to get in line and help swing the pendulum of population back toward the country.

Good roads, good schools, community centers, attractive home grounds, recreations, shorter hours of labor, farm club work for boys and girls—all these and a multitude of other improvements must turn the trick.

"Happy New Year," we call to our neighbor in passing, and "Happy New Year" she passes on in turn to her neighbor on the other side. Of course we mean it, but what are we going to do about it? Happy, indeed, will the New Year be if everyone who voices the greeting does his best to make it come true. It is the season for retrospection and reconstruction, and one has only to review the accomplishments of project women in the past to feel confident they, at least, will continue to do their part toward creating more nearly ideal rural conditions and a happiness that will "stay put."

The Unveiling of the Cenotaph.

The following beautiful description of the unveiling of the Cenotaph and the funeral of the Unknown Warrior at Westminster Abbey was received by a friend of the Reclamation Service from a woman now residing in London. It will be of unusual interest to the women whose sons did not return, as an indication of the reverence and appreciation accorded every soldier of whatever country who made the supreme sacrifice for humanity.

"One of the most soul-stirring things I ever saw was the unveiling of the Cenotaph and funeral of the Unknown Warrior at Westminster Abbey. I took my place early on the Home Office Building, where the four queens were, and had a splendid view of the procession from Trafalgar Square down to the Abbey, and was close to the Cenotaph. You will doubtless have read an account of it all, but you can not realize the solemnity and deep reverence of the multitude. Scarcely a sound was heard; the whole air was filled with the scent of thousands of floral tributes, and then in the far distance the heavy roll of drums and the Funeral March from Saul played by the massed bands of the Guards.

"The King, Princes, clergy, and others stood by the Cenotaph, and at 10.45 came the procession; troops with arms reversed, buglers, and firing party; bands with drums draped with crape, generals, admirals, lords, and bishops, and people of every station of

life, honoring our dead heroes through the honor rendered to the one simple soldier whose body lay on the gun carriage draped with the Union Jack.

"The King saluted as the gun carriage stopped close to the Cenotaph, then stepped forward and placed a lovely wreath of laurels and crimson roses on the coffin. Then the Bishop of Canterbury said the Lord's prayer and the great multitude together sang, with band accompaniment, 'O God our help in ages past.' It was immense and intensely inspiring.

"Then the bells of the Abbey chimed the four quarters and Big Ben boomed out eleven. On the last stroke the King touched the spring which released the flags covering the monument, and every head was bowed in silence for two minutes, so long it seemed, and so silent, that one felt the throbbing of one's heart could be heard by people around. For myself, I know that I trembled in every limb and longed to cry out.

"Then came the Last Post and there seemed to rise one huge sob from the crowds and yet a stillness when the King, Prince of Wales, M. P's and others placed floral tributes on the Cenotaph; one of these, a tall handsome old Indian Prince in snowy turban and flowing robes, put a long wreath there in memory of many of our faithful Indians who fell fighting for their Great White King.

"Next the bands played Chopin's Funeral March, and slowly they all filed past to the Abbey, and then hundreds of police carried over 1,700 floral tributes and laid them 'round the Cenotaph. They were sent by friends who could not be present. After that the public was allowed to walk past four abreast and place their flowers there.

"I shall never forget it—even now its memory makes me quiver, yet I am very thankful I was present, but how it makes one wish that we could bury all our strife, munitions of war, and instruments of death, and live peacefully with the whole world."

Women to Plant Avenue of Trees.

The Art Committee of the Federated Clubs of the city of Yakima, Yakima project, Washington, has donated \$100 to the city park board to be used in improving a new city park.

Planting of an avenue of hard maples from the city to the State Fair Grounds was also pledged by the committee, many members of which are enthusiastically in favor of a greater movement in tree planting in and about the city.

As a means of getting more greenery about the city the committee approved a greater observance of Arbor Day, and will foster the planting of trees and shrubs at that time.

The club is also planning to hold several art displays, the first to include water colors and photo-

graphs. These displays will be Fridays and Saturdays so the school children and teachers may have an opportunity to enjoy and profit by them.

ANOTHER TREE-PLANTING CAMPAIGN.

The city of El Paso, Tex., on the Rio Grande project, is also in the throes of a tree-planting campaign. This movement, inaugurated by the Young Men's Business League, is receiving the enthusiastic cooperation of the women of the city, and started with about a thousand men and women actively enlisted in the work. Boy Scouts distributed to every house in the city leaflets explaining the project and containing order blanks with information as to prices, etc. Later committee members visited each home to take orders and solicit the cooperation of the members.

This is a splendid start made by projects at the extreme corners of the reclamation territory, and should be followed by every community on the Government projects, but it should not be confined to cities and towns. Every rural women's club should swing in line and plan now for the biggest Arbor Day their section ever has seen.

Plant trees, avenues of them, along the highways; plant trees and shrubs in the school grounds, the cemeteries, and the churchyards; and last but not least plant trees in every available spot on your farm.

And let as many of them as possible be useful trees. There are many nut and fruit trees which can not be excelled for beauty of form and foliage. Their grateful shelter will attract birds that will fill your world with music and free the fields from harmful insects. The fruit trees will make your homestead a bower of beauty during the springtime. The harvest of fruits and nuts will fill your shelves and store-room with valuable and delicious food for the winter months, and the improved appearance of your farm will enhance its value and go a long way toward making the home and community an attractive place for the young people to live.

Orland Berkshires Win Fame for Nevada.

While no "blue ribbon" stories have been sent in from the Orland project, California, there seems to be a disposition to shine in the club work, and their claim to fame seems fairly well substantiated. It seems that last year the Anchorage Farm shipped some weanling pigs to Nevada, for use by the boys' and girls' clubs. These little Berkshires grew like a Nevada mining boom, and when they entered the competition with other club pigs they all came home with blue ribbons on the tails. They were the sensation of the fair.

This year the Nevada pig clubs are getting into the business early, and one week in November the An-

chorage Farm shipped 14 weanling pigs, each one with a family record long enough to make society leaders green with envy. As a result 14 Nevada boys and girls are proceeding to "develop" their new claims for the gold that is sure to come at the close

of the season. Other pigs will be shipped to Nevada, and Orland people feel sure that every boy or girl who becomes owner of one of these pedigreed animals will hereafter be a confirmed booster for the Orland Berkshire products.

Reclamation Record Cook Book.

MARSHMALLOW SOUFFLE.

(By A. P. Davis, Director Reclamation Service.)

- | | |
|---------------------------|--|
| 1 tablespoonful gelatin. | $\frac{1}{2}$ cup Maraschino cherries. |
| Whites 4 eggs. | 1 teaspoon vanilla. |
| 1 cup sugar. | $\frac{1}{2}$ teaspoonful salt. |
| $\frac{1}{2}$ cup pecans. | Coloring to suit. |

Soak one heaping teaspoonful gelatin in one-half cup cold water for 10 minutes; add hot water to fill cup and dissolve gelatin thoroughly; add salt to whites of eggs and beat well; whip in gelatin, when cold, and add sugar gradually; add vanilla or any desired flavoring.

Divide mixture in two equal parts; put color in one, or there may be three divisions with two colors and the white. Put in vessel in layers, placing the cherries and cuts between layers, and set in cool place.

Serve with whipped cream flavored to taste.

THANKSGIVING SALAD.

(By Ottamar Hamele, Chief Counsel Reclamation Service.)

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|---|--|
| 2 cups canned peas, tiniest size. | $\frac{1}{2}$ cup sweet pickles, cut size of peas. |
| $\frac{1}{2}$ cup American cream cheese, cut size of peas | Onion to suit, cut size of peas. |

Serve on lettuce leaves with dressing.

SANDWICH FILLING.

(By E. G. Paul, Purchasing Section, Washington Office.)

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|--|--|
| $\frac{1}{2}$ pound chopped beef. | 1 small onion. |
| $\frac{1}{2}$ pound cheese. | 1 small sweet pepper, either red or green. |
| 2 small or 1 large tomato (canned tomatoes may be used). | |

Put all through meat chopper and cook until well blended (usually about 15 minutes). Add beaten egg and cook a couple of minutes longer.

This will keep quite a while in cool place.

PUMPKIN PIE.

(By Mrs. Carrie Snyder, Caldwell, Boise project, Idaho.)

- | | |
|--------------------------------------|---|
| 1 pint of pumpkin cooked and sifted. | $\frac{1}{2}$ teaspoonful salt (level). |
| 3 eggs. | 1 teaspoon ginger. |
| 2 cups sugar. | $\frac{1}{2}$ teaspoon nutmeg. |
| 1 heaping teaspoon cinnamon. | $1\frac{1}{2}$ teaspoonfuls vanilla. |
| | 1 pint rich milk. |
| | This makes two pies. |

RED OR BLUE PLUM CONSERVE.

(By E. E. Roddis, District Counsel, Denver Office.)

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|--|--------------------------|
| 5 lbs. fruit (pits out). | 2 lbs. raisins. |
| 5 lbs. sugar. | 1 orange and rind. |
| $\frac{1}{2}$ lb. shelled English walnuts. | $\frac{1}{2}$ cup water. |

Cook fruit. Mix all ingredients except nuts and boil slowly for 1 hour. Then add nuts and cook 15 minutes longer.

RAISIN SPICE CAKE.

(By R. F. Walter, Assistant Chief Engineer, Denver Office.)

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|--|--|
| 1 cup sugar. | $\frac{1}{2}$ cup butter or butter substitute. |
| 2 cups flour. | 2 cups of water until 1 cup of juice is left which should be cooked before using, and then add 1 teaspoonful soda. |
| $1\frac{1}{2}$ cups raisins cooked in 1 cup of juice | 2 teaspoons cinnamon. |
| | 1 teaspoon each cloves, nutmeg. |
| 2 eggs. | 2 teaspoons baking powder. |

Cream butter and sugar and add the yolks of eggs. Mix the dry ingredients together and add alternately the dry ingredients and raisin juice. Lastly add the whites of eggs after beating. Bake in oiled pan.

DIVINITY PUDDING.

(By Charles Allen, Clerk, Denver Office.)

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|--------------------------------------|----------------------------------|
| 2 cups sugar. | 2 cups walnut meats. |
| 9 tablespoons coarse cracker crumbs. | $\frac{1}{2}$ lb. chopped dates. |
| 1 tablespoon baking powder. | 6 eggs. |

Beat eggs separately. Cream yolks with sugar, add cracker crumbs, then fruit and lastly beaten whites.

Bake 30 minutes in slow oven, and serve cold with whipped cream.

DOUGHNUTS.

(By P. S. Rosendorn, senior draftsman, Washington Office.)

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|-----------------------------------|-------------------------------------|
| 2 cups sugar. | 1 teaspoon salt. |
| 1 cup hot mashed potatoes. | 6 cups flour. |
| $\frac{1}{2}$ cup butter or lard. | 6 level teaspoonsful baking powder. |
| 1 cup sweet milk. | |
| 1 teaspoon nutmeg. | |

Mix shortening into mashed potatoes; add sugar, eggs, milk, and flour sifted with other dry ingredients. Toss on floured board and work in enough flour to make them roll easily. Cut out and fry in hot fat. ("Sawtay," a fat made from nuts, gives a good flavor.)

COFFEE CAKE.

(By Clara S. Davenport, Stenographic Section, Washington Office.)

- | | |
|-------------------------------|--|
| 1 heaping teaspoon of butter. | 2 teaspoons baking powder. |
| $\frac{1}{2}$ cup sugar. | Enough flour to make like muffin batter—about $1\frac{1}{2}$ cups. |
| 1 cup sweet milk. | |
| 1 egg well beaten. | |
| $\frac{1}{2}$ teaspoon salt. | |

Bake in two 10-inch square kelly cake tins. Sprinkle sugar and cinnamon on top and dot with bits of butter. Bake about 15 minutes in quick oven.

Diary of a Western Boy in Europe (Continued).

By William E. Smythe, Jr.

III. THE WONDERFUL CITY.

I AWOKE the next morning after a 12-hour sleep, to find the sunlight pouring in through my little attic window and all Paris awake. I dressed immediately and went down stairs in search of breakfast. I was ushered into a small room off the lobby where I partook of "petit dejeuner," which consists of French coffee, very different from American coffee, and hard rolls with delicious butter.

I next decided to get my bicycle from the station and then see Paris independent of the street cars. I went around the Opera and boarded the second-class section of a north-bound car. After arriving at le Gare Du Nord I spent considerable time finding the baggage room and then about an hour waiting for my turn. Finally, when my cycle was given to me I was told that as it was of English make I would have to pay duty on it. I argued for some time, and told them that I was only staying in Paris three days, and so ought not to pay duty on anything. However, I was made to understand that I would have to pay anyway, and so I submitted to having the thing weighed and sized up generally. Then the officer asked for my passport. He gave it one glance, and said in French: "Oh, you are American; you are my friend; go, there is no duty."

Once away from the station I headed toward the Seine and Notre Dame. Leaving my cycle with a small boy, I entered the great Cathedral. It is certainly the most magnificent I have ever seen, although in some ways I was more taken with Westminster Abbey. Leaving Notre Dame, I crossed to the opposite bank of the Seine, and followed the river past the Chambre des Deputes, and other famous buildings until I arrived at the Eiffel Tower. There I again parked my bicycle, paid my cinq francs, and waited with quite a large crowd for the next elevator.

If I forget everything I did on the Continent, I shall never forget that trip up the Eiffel Tower. An immense two-story elevator takes you from the ground up to the first landing. It doesn't go straight up like those in office buildings, but more of an incline until the first landing is reached. There one finds a large restaurant, a photograph gallery, and all kinds of stores. A wide sidewalk surrounds these shops, and I walked around again and again taking in the magnificent view. Although the first landing is only about one-fourth of the way to the top, it seems like the top of the universe. The people in the park below look like ants, and the barges on the river look very small. After about half an hour I took the elevator to the next landing where I changed very

quickly, and, after one more change, arrived at the very peak of the tower. There I found more stores and a lunch counter. I bought a number of souvenirs, mailed some letters, and had a late lunch.

I stayed more than an hour on the upper landing watching the pigmy trains switching in the yards just below, the great Ferris wheel slowly turning, and looking for well-known landmarks, the plainest of which were L'Arc de Triumph and Notre Dame. Finally, I reluctantly "returned to earth," and headed for the Hotel D'Antin by a more roundabout way. I spent the remainder of the afternoon reading and resting.

At 7 p. m. I had a big dinner at the hotel, and then went in search of a show. I strolled around for some time, but finally ended in going to a "movie," which I enjoyed very much. The feature was a French play called "Lorene." The comedy was Fatty Arbuckle in Coney Island. There were also Mutt and Jeff, and the Pathé News. It seemed very strange to see our old friends, Fatty Arbuckle and Mutt and Jeff, so far from home and speaking a foreign language.

It was 11 o'clock when I left the opera Cinema. I turned toward the Grand Café, which looked very cosy and foreign with its many tables of gay people out on the sidewalk. I took a seat and instructed the gargon to bring me café noir. This he did very promptly, and I spent a delightful half hour sipping French coffee from a deep glass, and taking in the scenery generally. Then I returned to my hotel and was in bed before midnight.

I awoke the next morning to another glorious day. After my "petit déjeuner" I started in search of a few last souvenirs, as I was leaving for Calais on the noon train. I again paid a visit to Brentano's, and after purchasing a few war relics and some stationery, I returned to the hotel and prepared to depart. Taking leave of the good propriétaire, I made my way to the Gare du Nord and bought my ticket for Calais. This time it was a third-class car with hard wooden seats, and in close proximity to the engine. The car was soon filled with working people, and at 2.15 the train was under way. The city was left behind, and we passed through a more thinly populated territory where tall brick houses were surrounded by small, well-kept gardens. I was later told that the people in these homes had supported themselves for generations with their acre or two acre gardens. The houses grew more scarce, and finally the green open country was reached.

Tiring of the scenery, I began to look about me in the compartment. Next to me sat an old man in a tattered brown suit with a sleeping puppy in his lap. Beyond him was a little girl with a happy, ruddy face. She looked yearningly at the puppy as if she would like to hug it but didn't dare. On the other side of her, a stiff little French woman, evidently her mother, looked reprovingly at the child, but lovingly at a fat gentleman on her left. On the seat facing us and next to the window sat a very happy young couple who shared their bread and sausage and wine, and kissed each other between every mouthful. Directly opposite me was a typical French soldier with his light blue uniform and tam-shaped cap. Next to the soldier sat a very old man who took bread, cake, cheese, and a bottle of wine from a little satchel at his feet. The puppy was awake in an instant, and sniffing with his little black nose, hopeful, yet looking with frightened brown eyes at his master. The old man smiled and offered the puppy a bit of cake which he received joyously, wagging the little red stump of a tail the while. Then the old man offered all of us a bit of bread and cheese and a draught of vin rouge. We all accepted, and were also joyous, each in his way. The little girl was allowed to cuddle the contented puppy in her arms, and "tout le monde" was happy as the train sped on toward Calais.

(To be continued.)

Men Take Over Umatilla Affairs.

Three years ago civic management of the little town of Umatilla, at the junction of the Columbia and Umatilla Rivers, was, by the power vested in the voters of the town, turned into the hands of women. Mrs. Della Paulu took her place as mayor, Mrs. Cherry, recorder, Mrs. Marion McKenzie, treasurer, and Mrs. Zella Brownell and Mrs. Oro Stevens served on the council, along with four mere men.

On taking office, the women found the following state of affairs: The town was practically bankrupt; through failure of the city to meet bills for lighting service the electric light company serving the town had been forced to discontinue service; city bonds were outstanding and the city had purchased fire apparatus and found themselves unable to meet payment.

So faithfully and to such good purpose have the women worked at the tasks set them during the past three years that the incoming civic body elected at the polls on November 2 find that like all good housewives the women have so swept and garnished and set in order the affairs of the little city that they have a record to maintain. They find that the lighting system is working regularly, fire apparatus paid for, bonds called in and drawing interest, city management well organized and moving smoothly, and

the city treasury has a surplus of from \$1,500 to \$2,000. Umatilla women proudly set their record before scoffers and it is hoped that the curious readers who wondered what the outcome would be three years ago will know what service has been given and how loyally the women have stood by in the face of criticism.

New city officers are as follows: Mayor, Fred Knudson; recorder, Elmer McKenzie; treasurer, Earl C. Brownell; councilmen, O. Stangeby, W. A. Conlon, L. W. Compton, Sid Saylor, Clifford Caldwell, and Earl Shaw.

The above article appeared in the Hermiston Herald of November 12, 1920. Is it out of order to just wonder why the last paragraph contains not the name of any woman?

Business Girls Study Budgets.

How should a working girl who makes between \$1,000 and \$1,200 a year, and who has all of youth's desires for advancement and for pretty things, spend her money?

The question was discussed at length at a recent meeting of the Yakima Business Girls' Club, and it seemed to be the consensus of opinion that a girl can not live and dress properly on this amount, especially if she lives away from home.

One of the national secretaries of the Y. W. C. A. from New York was present and spoke to them on the results of her study as to the manner in which girls should spend their income. She advised the girls to look far ahead when it came to their needs, and to make sure that they patronized the sales as one way of cutting down expenses. She also suggested that they need not head the style procession in order to be suitably and attractively dressed.

Buying a coat one winter and a suit the next, thus having both stand-bys to depend on in cold weather, was suggested as one means of economy in the dress line. She also advocated buying goods with the idea of service rather than indulging in style extremes. As a result of the discussion the following tentative budgets were submitted:

	Per cent.
Living expenses.....	60
Clothing	15
Laundry	6
Savings	13
Amusements and doctor.....	6
<hr/>	
Living expenses.....	52
Clothing	19
Laundry	6.3
Amusements and vacation.....	5.8
Savings	7
Doctor, etc.....	3.9
Educational	6

ENGINEERING INVESTIGATIONS.

Water Gas and Coal Gas Tar Paints.

By Julian Hinds, Engineer, U. S. Reclamation Service.

TAR paint is used extensively by the Reclamation Service for painting turnout gates and other underwater metal work, and for wood-stave pipe and is also used for painting the interior surfaces of metal flumes to prevent both erosion and corrosion. It appears to be the unanimous opinion of the project engineers that this tar paint is superior to any other paint for all kinds of submerged metal work. It is also considered very satisfactory for use on wood structures, or in any place where a black paint with a slightly sticky surface is not objectionable.

Barry Dibble, project manager, Minidoka project, Idaho, states¹ that in the winter of 1912-13 all penstocks and draft tubes in the Minidoka power plant, except No. 1, were painted with red lead carefully mixed and applied in accordance with the recommendation of one of the largest paint manufacturers in the country. The No. 1 penstock and draft tube were painted with water-gas tar and coal-gas tar in accordance with standard Reclamation Service specifications. At the end of the 1913 season the red-lead paint showed decided deterioration whereas the tar paint was in very good shape. At the end of the 1914 season the red lead had almost entirely disappeared where in contact with the water. The tar paint was in good condition in the penstocks, but was apparently getting thin on the outside of the draft tubes. The tar adhered well to the metal, and when scraped off left the metal bright.

C. H. Paul, in a report² on tar paint applied to the inside of the concrete outlet conduits at the Arrow Dam, Boise projects, Idaho, states that the coating proved very successful. These conduits were 52-inch diameter holes through the concrete dam, very carefully made with wood forms. After the forms were removed the surfaces were trimmed, scraped, washed with grout, and painted with two coats of water-gas tar and two coats of coal-gas tar. The water-gas tar was used thin so that it soaked well into the pores of the concrete, a penetration of something over one-sixteenth inch being obtained. This caused the coal-gas tar to "enter the concrete and bind the particles together, completely filling the voids at and near the surface and coating the concrete with a slick and fairly durable finish, cheaply and easily applied." After a season's service under heads up to 100 feet and velocities up to 64 feet per second, this paint was in good condition and Mr.

Paul states that "it is the opinion of men familiar with all conditions that the use of this tar coating gave thoroughly satisfactory service."

In discussing the San Fernando inverted siphon, Los Angeles water supply,³ Burt A. Heinly states that water-gas and coal-gas tar were used for painting steel siphons because it was believed to be the cheapest and best material to be had.

In the fall of 1915 an experimental metal flume painted with various brands of paint was installed on the Sun River project, Montana. Four proprietary brands of paint were used and water-gas and coal-gas tar. The tar paints did not conform exactly to present specifications inasmuch as the fats were not removed from the water-gas tar (causing much delay on account of failure to dry properly) and the coal-gas tar was apparently too thick to spread properly. In fact all the paints except No. 2 were thick, and owing to lack of experience with paints of this class the painters found it difficult to secure good workmanship. Only one coat of coal-gas tar was applied. A number of black and galvanized sheets of various metals were also left unpainted. Paint was applied to both the inside and the outside surfaces of the sheets. These sheets have been inspected at various times and their conditions recorded in detail. In commenting on the performance of these paints in a report dated December, 1919, after four years' service, the project manager states that:

No. 2 paint has practically disappeared, there being no noticeable difference between this and the plain, unpainted metal next to it. No. 3 is peeling from the galvanized metal on which it was placed. No. 1, No. 4, and the tar paints are peeling off in places, and the metal is rusting beneath; however, the paint on the outside of the sheets is generally still intact, and also on the inside above the water line.

A similar flume was installed on the Salt River project, Arizona, in 1915, and on April 15, 1917, the project manager stated that:

The sheets that have been galvanized are all in perfect condition. Of the other coatings the No. 1 paint seems to have done the best, with coal tar, No. 2, No. 3, and No. 4 coming next in the order named.

In 1914 a flume was installed on the Boise project, Idaho, to test the rust-resisting qualities of various brands of metal sheets, both black and galvanized. Incidentally an attempt was made to determine the value of tar as a protective coating by painting alternate sheets of the flume with one coat of water-gas tar

¹ RECLAMATION RECORD, September, 1915, p. 425.

² RECLAMATION RECORD, January, 1916, p. 46.

³ ENGINEERING NEWS, May 21, 1914, p. 1148.

followed by two coats of coal-gas tar. No mention is made of difficulty in applying the paint, and since tar paint had been previously used on the project, it is probable that a good job of work was secured. In December, 1918, Engineer C. C. Fisher, who installed the flume, reported as follows:

The tar paint * * * has stood the test of four years excellently. The metal was new when this paint was applied and there was a possibility, on account of the smoothness of the surface, that it would peel off in time. But there are no signs whatever of any peeling of the paint, and especially on the galvanized sheets it looks almost as good as when first applied. This, to my mind, is a good test of the superior quality of this method of painting metal for under water use.

In commenting on the use of tar paint for protecting the interior of galvanized metal flumes on the Strawberry Valley project, Utah, Project Manager J. L. Lytel in a letter dated October 17, 1917, states that:

This coating filled up all the joints between the sheets and appears to have protected the inside of the flumes from all action of water, in some of the flumes the velocity exceeding three feet per second.

In his report on the inspection of flumes on the Uncompahgre project, Colorado, published in a recent number of the RECLAMATION RECORD,⁴ Fred D. Pyle, project manager, reports his observation of 59 flumes painted with tar and various other paints, stating in conclusion:

A heavy coating of coal tar has proven to be the best method of protecting the flumes when properly applied.

The above reports, together with the orally expressed opinion of other engineers in the Service, seem to indicate definitely that tar paint has proven satisfactory for the uses for which it has been tried. However, the value of these products and the proper method of applying them is not so well understood as it should be, and a brief statement of the source and nature of these materials may be of interest. The following information is taken largely from data furnished by the Denver Gas and Electric Light Co. and compiled by E. A. Moritz, formerly office engineer in the Denver office, now project manager, Flathead project, St. Ignatius, Mont.

Water-gas tar and coal-gas tar are by-products from the manufacture of gas. The companies producing this material are primarily interested in the manufacture of gas and usually make no attempt to control the tar. A large percentage of the tar is disposed of to roofing paper manufacturers. The tar varies according to the coals or oils used and other conditions incident to the manufacture of gas, and products from a plant in one locality may be quite different from those obtained from another.

Not all of these tars are suitable for use as paint, and it is necessary that all materials be purchased under definite specifications. It is not always possible to secure from a given plant material to meet definite requirements. The value of the tar sold for paint is too small in comparison to the value of the gas produced to justify any change in the materials used or in the method of manufacture. The matter is more one of selection than of control; that is, the material must be selected from some plant that can meet the specifications. A number of plants, however, have special paint departments which specialize in the refining of the tar and in making such alterations in its composition as may be necessary to render it suitable for use as a protective coating.

Water-gas tar is a by-product from the manufacture of water gas, and as it comes from the retort contains a large quantity of water and fatty oils. The so-called refined tar has only the water removed. The oils render the tar so slow drying that it is inconvenient for use as a paint. When the fatty oils, which are said to add nothing to the value of the tar as a protective coating, are removed the product is called water-gas pitch and will not flow. This pitch can be thinned to the consistency of paint by the addition of light oils or creosote. Light petroleum distillate has also been used for this purpose. From 40 to 60 per cent of thinner will usually be required to bring the tar to the proper consistency. It is claimed that certain acids contained in creosote tend to react with steel, and for that reason creosote should not be used in the preparation of paint for metal work. On account of its preservative properties, however, creosote is considered desirable where the paint is to be used on wood. Light oil and gasoline, when used for thinning, entirely disappear as the coating dries, and serve no useful purposes other than to assist in spreading the pitch.

Coal-gas tar can be obtained of any consistency desired, from that which can be applied with brushes without heating to that which requires considerable heating. Tar having a melting point of 105° to 110° F., by the cube method, as required by the specifications quoted below, is plastic at a temperature of 50° F., but is not liquid nor is it hard and brittle like pitch. This material may be thinned for application by heating or by adding creosote or light oil as in the case of water-gas tar. For brush work or dipping heating is probably preferable. Where the paint is to be applied by a spraying apparatus the tar must not be heated, since the mixture of air and hot tar is explosive. Proper consistency in such case should be secured by adding one of the thinning materials named.

Both the creosote and the light oil used for thinning tar paints are distilled from coal tar. The light oil has the appearance of water.

⁴ RECLAMATION RECORD, November, 1920, p. 521.

The Reclamation Service has adopted as standard for tar paint the following specifications for metal work:

All metal work, except as herein provided, shall be thoroughly cleaned of all loose scale and given one coat of water-gas tar followed by two coats of coal-gas tar. All coats shall be applied when the temperature of the air and metal is not less than 60° F. The water-gas tar shall have a specific gravity of not less than 1.05 nor more than 1.10 at 60° F., and shall be of such consistency that it can be applied with brushes. The melting point of the coal-gas tar, as determined by the cube method, shall lie between 105° and 110° F. Both the water-gas tar and the coal-gas tar shall be freed from moisture, and all fats shall be extracted from the water-gas tar. If the water-gas tar is too thick to spread, the contractor may use suitable light oil, satisfactory to the engineer, for thinning. The water-gas tar may be applied without heating, but the first coat of coal-gas tar, which may be applied a few hours after the application of the water-gas tar, shall be applied hot and brushed out as thin as possible so that the coating will not run or peel after it is dry. The second coat of coal-gas tar shall not be applied until after the first coat has set. This tar paint shall be well worked into all joints and open spaces. Pinholes, screw threads, and all machine-finished surfaces shall not be painted, but shall be coated with white lead and tallow as soon as they are finished.

The American Rolling Mill Co. has made a number of experiments with different mixtures of coal-tar products, and they recommend coal tar mixed with 20 per cent of Portland cement. This mixture, it is claimed, is less affected by temperature, and the cement takes up any water and neutralizes the acid in the creosote content of the tar. The Reclamation Service has no data upon the value of cement-tar paint.

In addition to giving superior service for certain kinds of work, tar paint is economical in first cost, and it is claimed by its advocates that it is easily and cheaply applied. Tar must be worked, however, in an entirely different way from ordinary paint, and many painters find it difficult to handle at first. The manner of applying the tar has been discussed with the men doing the work in some of the Denver shops. These men state that the tar is easy to apply, but they are unable to give any specific directions for the work. The water-gas tar is thinned until it can be applied with brushes, but should not be made too thin. The coal tar is thinned and heated until it works satisfactorily. No definite proportion of thinner is used, and no thermometer test is made in heating. No painting is done on chilled or damp metal.

Where the nature of the articles permit they may be dipped in the paint. A quantity of light steel pipe has been treated in this way on the Okanogan project, Washington, in the hope that the resulting coating will prove superior to the asphaltum coating usually used for this purpose. Calvin Casteel, project manager, states that the results appear to be very satisfactory, though the pipe has not been installed for a

COURTESIES APPRECIATED BY FOREIGN REPRESENTATIVE.

Hardly a week passes that some representative of a foreign country interested in irrigation development or some allied phase of engineering does not visit the Washington office of the Reclamation Service preparatory to a trip of inspection to our projects.

Among our recent visitors was Señor Carlos A. Volpi, one of the principal engineers of the Irrigation Service of Argentina, who visited a number of our projects with a view to securing information which would be helpful in the proposed irrigation development of his own country.

We feel sure that our engineers will be interested in the following letter from Señor Volpi, and we reiterate the hope so felicitously expressed by him that visits of this character may result in cementing even more firmly the friendship now existing between the United States and this great sister Republic:

REPUBLICA ARGENTINA,
MINISTERIO DE OBRAS PUBLICAS,
DIRECCION GENERAL DE IRRIGACION,
New York City, November 25, 1920.

MR. MORRIS BIEN,
Assistant Director of the
U. S. Reclamation Service,
Washington, D. C.

SIR: I am very sorry to tell you that it is impossible for me to come to Washington personally, and express to you my gratitude for your kind assistance, and the valuation information which I received from the Reclamation Service.

According to your advice, I have made several inspections in the Western States in the following project: Denver, Grand Valley, Strawberry, Minidoka, Boise, Umatilla, Salt River, and Rio Grande.

I wish also to express, on behalf of the Argentine Reclamation Service, its great appreciation and sincere thanks for the courteous and kind assistance which the representatives of your Reclamation Service rendered me while inspecting the above-mentioned project.

I am very satisfied with my investigations, and I believe that your wonderful experience in this branch of human activities will be of great interest to my country, and I hope that this intellectual exchange will mean a greater understanding, and a better friendship between the two sister Republics.

Respectfully, yours,

CARLOS A. VOLPI.

sufficient length of time to afford a conclusive test of endurance.

The quantity of paint required to cover a given surface depends upon the consistency of the material, the method of application, and the nature of the surface to be painted. Roughly, 1 gallon of water-gas tar will cover about 160 square feet, and 1 gallon of coal tar will cover about 80 square feet for one coat of each. The amount of surface that can be covered by a man in a day will, of course, depend upon the nature of the work. Small structural work will require considerably more time than an equal area of flume or pipe surface.



Reclamation Service Wins Again in Suit Over Seepage Water.

NOVEMBER 15, 1920, the United States Circuit Court of Appeals, Eighth Circuit, handed down a decision in *Ramshorn Ditch Co. v. United States*, affirming the decree of the trial court (254 Fed., 842), adjudging the United States entitled to the use of 45½ second-feet of seepage water flowing in Sheep Creek and arising from the North Platte irrigation project in Nebraska. The case was presented for the Government on appeal by Ethelbert Ward, special assistant to the Attorney General; Thomas S. Allen, United States attorney, and Henry A. Cox, district counsel, Reclamation Service.

Federal Water Power Commission's Jurisdiction Relative to Irrigation.

The Solicitor for the Interior Department, in an opinion dated November 6, 1920, held that the Federal Power Commission, created under the act of June 10, 1920 (41 Stat., 1063), is concerned with the administration of the public domain in those cases only where the sole use sought is the development of hydroelectric power, and does not, therefore, disturb the jurisdiction of the Secretary of the Interior as to irrigation rights of way under the acts of March 3, 1891 (26 Stat., 1101), and May 11, 1898 (30 Stat., 404), or irrigation systems constructed under authority of the act of February 21, 1911 (36 Stat., 925), since as to matters last named, the development of hydroelectric power is subordinate and auxiliary to the main purposes of irrigation. This decision arose in connection with the approval by the Secretary of the Interior of an application made by the Paradise Verde Irrigation District, in Arizona, for rights of way over public lands for its irrigation system.

Carey Act Lien Applicable Only to Lands With Sufficient Water Supply.

The amount of land to be patented under a Carey Act project is a matter for the determination of the Land Department, the test being the acreage that can be actually irrigated under the irrigation system con-

structed, and not the quantity originally withdrawn in aid of such purpose. (*Twin Falls Salmon River Land & Water Co. v. Davis et al.*, 267 Fed., 382.) In this case the court held that the company named, which had constructed the system under contract with the State of Idaho, would acquire a lien on such lands only as had been furnished water sufficient to reclaim them.

Distinction as to Rights in a Well and the Pump Connected Therewith.

An easement consisting of a right to take certain quantities of water from a well on lands of another confers no such interest in the pumping plant connected with the well as would support an action of conversion against the owner of the land for dismantling or taking possession of the plant. (*Little et al. v. Roof*, 192 Pac., 868.)

Damages for Delay by Government of Inspection of Material.

Where the Government delays inspection of material, furnished under a contract providing for inspection before acceptance, for an unnecessary period after receipt of notification from the contractor to inspect, cost of fire insurance on the material, and interest on loans covering the period of delay, or any other direct money loss or expense caused the contractor by reason of such delay, which otherwise would not have been caused, may be reimbursed the contractor. (27 Comp. Dec., 367.)

Attorney Loses Suit Against Reclamation Service.

John E. Bennett, a San Francisco attorney, brought suit against the United States in Federal District Court, northern district of California, second division, for \$2,835 alleged to be due him for services rendered in securing deeds to lands riparian to Lake Tahoe, Newlands project, Nevada. The case was tried at San Francisco November 12, 1920, before United States District Judge Frank H. Rudkin, and resulted in a dismissal of the action. Frank M. Silva, United States attorney; E. M. Leonard, assistant United States attorney; and Henry A. Cox, district counsel, Reclamation Service, appeared for the Government.



E. E. RODDIS.

District counsel, United States Reclamation Service, Denver, Colo. Born in Cherokee, Iowa, October 19, 1869; took a mechanical engineering course in the Iowa Agricultural College at Ames, Iowa; was admitted to the bar in the State and Federal courts of Minnesota in 1897, and to the bar of the Supreme Court of the United States in 1916; was engaged in the general practice of law in the State of Minnesota for 12 years; in 1909 entered the employ of the Reclamation Service, and has been stationed successively in Washington, D. C.; Helena, Great Falls, and Malta, Mont.; Provo, Utah; Phoenix, Ariz.; and Denver, Colo. Is now in charge of the Legal Section of the office of the chief engineer at Denver.



ARMAND OFFUTT.

District counsel, United States Reclamation Service, Denver, Colo. Born in Washington, D. C., August 16, 1885; was educated in the public schools of his native city, and in 1912 was graduated from the law department of Georgetown University; admitted to practice in the Supreme Court of Colorado, the Supreme Court and the Court of Appeals of the District of Columbia, and the Supreme Court of the United States; was employed at Washington, D. C., in the Navy Department from December 1, 1902, to April 30, 1907, and in the Reclamation Service from May 1, 1907, to May 31, 1915; has been in our Denver office since June 1, 1915, at present being associate legal adviser in the office of the chief engineer.

The Oil-Leasing Act.

Inasmuch as the reclamation fund will be substantially increased under the oil-leasing act of February 25, 1920 (41 Stat., 450), our readers will find of particular interest the following extract from a memorandum submitted by the Secretary of the Interior to the Secretary of the Treasury relative to an ap-

propriation required by the Bureau of Mines for enforcement of the act, to wit:

Up to November 1, 1920, more than 7,500 applications for prospecting permits and for leases have been filed with the General Land Office. * * * These permits and leases are in the following States

and Territories: Arizona, California, Alaska, Colorado, Idaho, Louisiana, Montana, Nevada, New Mexico, Oklahoma, Oregon, South Dakota, Utah, and Wyoming. * * *

Conservative estimates show that present known oil lands of the Government in the Salt Creek (Wyo.) field and in California should produce annually over 14,000,000 barrels, yielding the Government a probable annual income from oil amounting to \$6,100,000. This does not include income from Government lands in other oil fields, nor from prospective pools, nor from gas. The Government has recently won suits covering land at Ferry Lake, La., and a considerable production in that area needs immediate attention. * * *

The Government, as the owner and prospective lessor of vast resources of mineral deposits of the character named from which will be derived large revenues, should make necessary provisions for the carrying out of the purposes of said act by an adequate system of inspection of prospecting permits, licenses, and leases on the public domain. It is important that these mineral lands be developed in such a manner as to permit the extraction of the greatest possible amount of mineral and, in mining and subsequent treatment, to reduce all waste to a minimum, as well as to safeguard life and property. Moreover, a thorough supervision of such operations will mean that the revenues received from such deposits of the Government will be materially increased. The Government should also be concerned not only with protecting its interests in the mineral deposits on the public domain in its capacity as lessor but with setting, as well, a high standard of operation of these mineral resources for the various States, mining companies, and individuals to follow in the interest of the public welfare. (House Doc. No. 902, 66th Cong., 3d sess.).

Bills Introduced in Congress.

IN THE HOUSE.

H. R. 14469.—"A bill to amend an act entitled 'An act to create a Federal Power Commission; to provide for the improvement of navigation; the development of water power; the use of the public lands in relation thereto; and to repeal section 18 of the river and harbor appropriation act, approved August 8, 1917, and for other purposes,' approved June 10, 1920," introduced December 6, 1920, by Representative John J. Esch of Wisconsin. This bill prohibits permits for "dams, conduits, reservoirs, power houses transmission lines or other works for storage or carriage of water, or for the development, transmission, or utilization of power within the limits of any national park or national monument * * * without specific authority of Congress." S. 4554 is a similar bill.

H. R. 14955.—"A bill to amend section 2 of the act of August 9, 1912 (37 Stat., 265), relating to liens in patents and water-right certificates," introduced December 11, 1920, by Representative Moses P. Kinikaid, of Nebraska. This bill delays for one year the passing of title to certain land to the United

States upon default in the payment of water charges on Federal irrigation projects. It also provides for cancellation of liens for water charges when contract for payment has been made with an irrigation district.

IN THE SENATE.

S. 4529.—"A bill for the erection and maintenance of a dam across the Yellowstone River, in the State of Montana," introduced December 7, 1920, by Senator Thomas J. Walsh, of Montana. The bill grants to the State of Montana the right to construct, for irrigation purposes, a dam not more than 3 miles below Lake Yellowstone.

S. 4542.—"A bill to bring about the more effective coordination of the executive departments, to create the Department of Public Works and the Department of Public Welfare, and for other purposes," introduced December 7, 1920, by Senator Philander Knox, of Pennsylvania.

S. 4554.—"A bill to amend an act entitled 'An act to create a Federal Power Commission; to provide for the improvement of navigation; the development of water power; the use of the public lands in relation thereto; and to repeal section 18 of the river and harbor appropriation act, approved August 8, 1917, and for other purposes,' approved June 10, 1920," introduced December 7, 1920, by Senator Wesley L. Jones, of Washington. This bill is similar to H. R. 14469.

S. 4598.—"A bill to provide funds for reimbursing farms on Yuma project, Arizona-California, and to provide funds to operate and maintain the Colorado River front work and levee system of Yuma project, Arizona-California," introduced December 10, 1920, by Senator Henry F. Ashurst, of Arizona.

Former Attorneys of the Reclamation Service.

There was published in the August, 1920, issue of the RECLAMATION RECORD, under Law Notes, a list of former attorneys of the Reclamation Service. The names of three attorneys were inadvertently omitted from this list, to wit: W. W. Davis, Washington, D. C., who entered the service May 24, 1913, and resigned May 6, 1917; Alice B. Preuss, El Paso, Tex., who entered the service May 10, 1917, and whose appointment was terminated on account of reduction of force on September 18, 1918; and T. F. Fly, El Paso, Tex., who entered the service October 8, 1917, and was furloughed for two years on April 16, 1920.

—Ottamar Hamel.

The Treasury Savings Movement has been splendidly successful in the schools, with the children as well as with the leaders of educational thought in America.

IRRIGATION STATISTICS, FOURTEENTH CENSUS.

The Director of the Census announces, subject to correction, the following preliminary statistics on irrigation for the counties named. Similar state-

ments for other counties will be issued as soon as the figures are available and will be published from time to time in the RECLAMATION RECORD.

Irrigation by counties, 1920 and 1910.

State and county.	Acreage to be irrigated by works either completed or under construction.			Acreage to which existing works are capable of supplying water.			Acreage irrigated.			Acreage available for settlement in 1920. ²
	1920	1910	Increase. ¹	1920	1910	Increase. ¹	1919	1909	Increase. ¹	
Arizona:										
Apache.....	27,571	34,807	- 7,236	16,159	9,930	6,229	12,070	8,853	3,217	.....
Cochise.....	33,848	14,141	19,707	19,115	6,488	12,627	13,146	4,900	8,246	2,394
Maricopa.....	409,967	455,361	-45,394	394,589	236,061	158,528	282,130	199,052	83,078	5,980
Pima.....	40,973	24,484	16,494	25,515	11,876	13,639	16,883	10,160	6,723	5,985
Pinal.....	65,756	89,400	-23,644	34,746	31,100	3,646	28,647	25,431	3,216	7,780
California:										
Inyo.....	93,072	92,319	753	75,793	71,815	3,978	71,611	65,163	6,448	4,740
Riverside.....	221,620	210,452	11,168	123,645	103,233	20,412	101,944	71,436	30,508	20,315
San Bernardino.....	210,662	152,415	58,247	122,353	86,107	36,256	107,363	70,278	37,085	12,609
Santa Barbara.....	16,143	13,603	2,540	14,709	13,572	1,137	10,947	12,012	- 1,065	.....
Ventura.....	40,958	56,357	- 6,399	35,516	49,407	-13,891	31,592	25,273	6,319	2,700
Colorado:										
Chaffee.....	38,116	42,605	- 4,489	30,057	32,383	- 2,326	29,567	16,142	13,425	.....
Fremont.....	44,059	42,414	1,645	35,697	37,136	- 1,439	29,884	24,737	5,147	4,663
La Platte.....	111,462	151,387	-39,925	78,727	100,479	-21,752	63,755	40,840	22,915	8,206
Las Animas.....	52,212	35,149	17,063	45,082	32,566	12,416	41,625	26,093	15,532	.....
Park.....	54,179	68,969	-14,790	50,794	65,384	-14,590	48,533	64,824	-16,291	.....
Idaho:										
Adams ³	42,786	.....	.....	32,676	.....	.....	30,900	.....	.....	.....
Franklin ³	41,982	.....	.....	28,219	.....	.....	26,400	.....	.....	.....
Idaho ⁴	3,843	.....	.....	3,128	.....	.....	2,603	.....	.....	.....
Lemhi ⁴	135,872	.....	.....	96,331	.....	.....	66,811	.....	.....	3,900
Oncida ⁴	22,893	.....	.....	15,364	.....	.....	14,067	.....	.....	.....
Owyhee.....	119,061	162,111	-43,050	74,474	44,240	30,234	62,901	21,777	41,124	4,934
Payette ⁵	73,611	.....	.....	63,653	.....	.....	53,228	.....	.....	5,376
Twin Falls.....	312,121	384,590	-72,469	271,443	246,625	24,818	261,422	100,545	160,877	7,699
Valley ⁵	31,984	.....	.....	24,148	.....	.....	15,591	.....	.....	.....
Washington ⁴	59,410	.....	.....	51,865	.....	.....	41,248	.....	.....	1,500
Montana:										
Broadwater.....	107,664	72,436	35,228	60,219	50,870	9,349	25,032	39,612	-14,580	.....
Chouteau ⁴	40,114	.....	.....	18,560	.....	.....	5,889	.....	.....	.....
Pondera ⁴	212,698	.....	.....	103,371	.....	.....	55,724	.....	.....	27,198
New Mexico:										
Bernalillo.....	19,056	25,510	- 6,454	15,218	20,375	-5,157	14,536	14,832	- 296	650
Chaves ⁴	57,565	.....	.....	47,473	.....	.....	42,254	.....	.....	.....
Colfax.....	117,715	156,503	-38,788	90,881	52,391	38,490	66,187	30,756	35,431	57,529
Edwy ⁴	87,621	.....	.....	59,794	.....	.....	51,394	.....	.....	2,976
Grant ⁴	7,751	.....	.....	7,213	.....	.....	7,101	.....	.....	.....
Lincoln.....	11,897	9,678	2,219	6,368	7,907	- 1,539	6,155	7,355	- 1,200	.....
Luna.....	34,786	15,291	19,495	21,133	9,763	11,370	11,323	5,347	5,976	610
Mora.....	37,673	32,668	5,005	29,749	28,137	1,612	18,733	19,083	- 350	.....
Ctero.....	12,117	12,173	-56	8,575	8,359	216	7,566	6,378	1,188	.....
Rio Arriba.....	68,631	67,384	1,247	50,237	51,635	- 1,398	46,046	45,673	373	.....
Roosevelt ⁴	1,636	.....	.....	1,483	.....	.....	657	.....	.....	.....
Sandoval.....	32,988	37,136	- 4,148	26,731	21,791	4,940	23,268	18,259	5,009	.....
San Juan.....	67,515	77,169	- 9,654	48,195	52,656	- 4,461	42,470	29,520	12,950	3,705
San Miguel.....	68,706	52,417	16,289	43,177	16,902	26,275	16,465	14,318	2,147	940
Santa Fe.....	12,244	51,758	-39,514	10,858	16,712	- 5,854	10,582	16,180	- 5,598	.....
Sierra.....	18,432	10,426	8,006	9,533	9,959	- 426	8,491	3,637	4,854	100
Socorro.....	29,780	41,760	-11,980	13,401	22,532	- 9,131	11,110	14,289	- 3,179	5,209
Taos.....	88,265	60,426	27,839	67,061	44,395	22,666	59,607	41,486	18,121	4,400
Union.....	20,056	30,107	-10,051	17,806	8,766	8,840	6,941	6,315	626	1,592
Valencia.....	49,365	74,814	-25,449	42,666	51,948	- 9,282	29,241	30,302	- 1,061	.....
Washington:										
Adams.....	1,577	5,123	- 3,546	1,182	1,655	- 473	783	1,523	- 740	.....
Benton.....	82,748	87,384	- 4,636	58,144	50,653	7,491	47,725	23,437	24,288	15,756
Chelan.....	71,555	53,497	18,058	57,307	27,979	29,328	41,412	23,620	17,792	3,750
Columbia.....	3,246	3,922	- 676	2,777	2,797	- 20	1,912	2,174	- 262	.....
Ferry.....	7,421	5,271	2,150	2,253	4,258	- 2,005	791	397	394	.....
Grant.....	13,106	14,456	- 1,350	9,582	8,501	1,081	7,776	3,230	4,546	.....
Kittitas.....	87,775	92,940	- 5,165	83,573	72,348	11,225	81,977	68,892	13,085	.....
Klickitat.....	41,715	18,590	23,125	30,760	7,461	23,299	27,978	4,681	23,297	500
Okanogan.....	70,273	53,012	17,261	51,175	31,670	19,505	35,043	15,238	19,805	7,995
Pen Oreille ⁵	1,555	.....	.....	1,138	.....	.....	352	.....	.....	.....
Spokane.....	39,438	52,330	-12,892	23,940	17,140	6,800	16,161	12,143	4,018	3,638
Stevens ⁴	25,499	.....	.....	18,055	.....	.....	8,805	.....	.....	575
Thurston ⁵	6,906	.....	.....	5,000	.....	.....	2,000	.....	.....	2,000
Walla Walla.....	44,494	39,622	4,872	38,240	20,954	17,286	22,961	10,008	12,953	9,587
Whitman.....	4,138	3,057	1,081	2,536	1,705	831	2,099	1,377	728	.....
Yakima.....	309,233	331,455	-22,222	242,726	186,050	56,676	230,033	148,630	81,403	3,334

¹ A minus sign (-) denotes decrease.² To be supplied with water by works either completed or under construction.³ Organized since 1910; hence comparative figures for 1910 can not be given.⁴ Boundaries changed since 1910; hence no comparative figures can be given.⁵ Irrigation figures not reported separately in 1910; consequently no comparative figures for 1910 can be given.

The Reclamation Record.

Issued monthly by the Reclamation Service, Department of the Interior, under the authority of the Secretary of the Interior.

Copies of the RECLAMATION RECORD will be sent free of charge to any water user on our reclamation projects. The subscription price to others is 75 cents a year, payable in advance. Subscriptions may be forwarded to the chief clerk, United States Reclamation Service, Washington, D. C., and remittances (postal money order or New York draft) should be made payable to the special fiscal agent, United States Reclamation Service. Postage stamps will not be accepted.

Material for publication in the RECLAMATION RECORD should be addressed to *Editor*, United States Reclamation Service, Washington, D. C., and should be mailed in time to reach the editor not later than the 14th of the month, in order to insure publication in the succeeding month's issue of the RECORD.

HUGH A. BROWN, EDITOR.

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Reclamation Record.

[To be used only by persons who are NOT water users on the projects of the U. S. Reclamation Service.]

_____, 1921.

CHIEF CLERK,

U. S. Reclamation Service,
Washington, D. C.

DEAR SIR: I am NOT a water user on one of the projects of the U. S. Reclamation Service, but wish to receive the RECLAMATION RECORD each month.

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NOVEMBER WEATHER IN THE WESTERN STATES.

By P. C. Day, U. S. Weather Bureau.

The month as a whole had no marked variations in temperature from those normal for the season, except in portions of the central Rocky Mountain region, where on account of a heavy covering of snow that fell on the closing days of October the weather remained unusually cold during the first two weeks.

The first week of the month was cooler than normal throughout most of the country to westward of the Rocky Mountains, and similar conditions continued during the second week, except for increasing cold over the northern districts. The severest cold of the month occurred about the 12th and 13th, when minimum temperatures 10° or 15° or more below zero were reported from exposed points in Wyoming and parts of adjoining States.

The average temperatures for the week ending November 16 ranged from 15° to more than 30° below the normal over the greater part of the Rocky Mountain section. Along the Pacific coast, and in portions of Nevada and Arizona, the week was slightly warmer than normal.

The latter half of the month was notably free from marked temperature changes, and on the whole was slightly warmer than usual.

Precipitation was scanty during the first half of the month, particularly over the far Northwest, where rain is usually frequent at that season. Immediately following the middle period of the month rains set in over the Coast States and extended inland to some extent. Heavy falls occurred from northern California to Washington, but the amounts became much lighter to eastward, and little if any fell over the main portions of the Plateau and Rocky Mountain regions.

The latter part of the month had moderate rains over the northern coast districts, but the major portion of the West was without material precipitation either as snow or rain.

The month as a whole was favorable for harvesting late crops and for cattle on the ranges, except in portions of Wyoming, Colorado, and adjoining States, where severe cold and local deep snow cover during the first two weeks greatly hindered the digging of beets and potatoes and prevented grazing on the ranges.

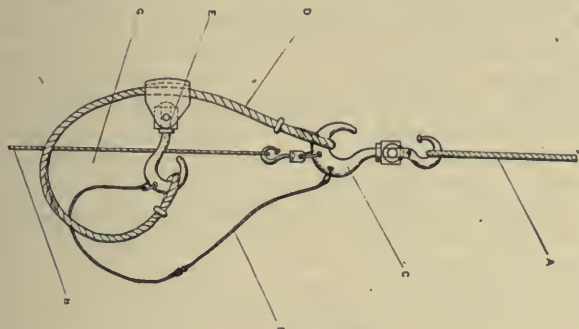
You are publishing a splendid magazine, and we hear much good comment concerning it.—F. C. Henshaw, Secretary, Salt River Valley Water Users' Association, Phoenix, Ariz.

SELF-RELEASING CHOKER USED IN CLEARING RESERVOIR SITES, YAKIMA PROJECT.

By C. E. Crownover, Engineer, U. S. Reclamation Service.

IN connection with the construction of storage reservoirs on the Yakima project, Wash., it is necessary to clear the flooded areas which are heavily timbered. After the merchantable timber is removed, a large amount of unmerchantable stuff remains which has to be felled, piled, and burned.

The piling is done around a spar tree, or gin pole, using double-drum donkey engines. The usual method has been to attach a choker (a short length of wire rope with loops in each end) around a log or several logs, and hook both loops into the main line hook. The load is then drawn upon the pile, and the engine stopped while a man climbs the pile, releases one end of the choker, and descends to a place of safety. The engine is then reversed and the haul-back line pulls the choker free and returns it to the place of loading. The greatest objection to this method is the time lost in waiting for a man to climb the pile, release the choker, and return to a place of safety. Climbing a high, loose, and often wet and slippery pile is dangerous and results in many personal injury cases.



Automatic choker.

Recently a patent automatic, self-releasing choker has been in use that eliminates all these objections. Its operation is as follows: The log or logs are placed in the bight (G), and when the main line (A) is made taut the choker (D) slides through the swivel hook (E) and tightens around the load. In this manner it is drawn to any position on the pile. The engine is immediately released, and the pull being on the haul-back (B), the main hook is released from one end of the choker. The tag line (F) then becomes taut and releases the hook (E) from the other end of the choker. The choker is then entirely free from the load and returned by the tag line to the point of loading.

NEWS LETTER TO PROJECTS.

Before this issue of the RECORD reaches the projects it is probable that Chief Engineer Weymouth will have begun the issuance every week or so of a one or two-page neostyled news letter to the projects.

The news letter will contain items mostly relating to the work in the field, of interest to the employees of the Service. It will probably cover such items as proposed trips by the officials of the Service to other projects, cities, conventions, or congresses and their purpose; possibly a record of births, deaths, and marriages among the force; and may call attention to unusual events on the projects, such as proposed openings of new land, sudden changes in financial or economic conditions, etc.

An indication of the scope of the proposed news letter was given in a similar letter issued from the Washington office on November 18. Subsequent issues will, however, be issued from the Denver office, as the news will be received on the projects several days earlier than would be the case if the letter were issued from the Washington office.

We feel sure that such a news letter as outlined above will tend to maintain and foster that esprit de corps which is the keystone of our organization, and urge our employees to cooperate to the fullest extent in making this new publication a success.

ANNUAL REPORT, FISCAL YEAR 1920.

The annual report of the Reclamation Service for the fiscal year ended June 30, 1920, is available for distribution. The report relates in particular to the work completed and in progress during the fiscal year, but contains also information in regard to previous operations in order that the methods, progress, and results of reclamation work may be more readily understood.

Requests for copies of the report should be addressed to the Chief Clerk, U. S. Reclamation Service, Washington, D. C.

About 50 per cent of engine time is saved, which means also the time of a crew of high-priced men, and the danger attendant upon climbing the pile is entirely eliminated. The choker seldom fouls and has been known to run for a week at a time without a single instance of trouble.

The choker is the invention of a western farmer and is used extensively in land-clearing operations on the Pacific coast. The Service has a contract for its use whereby the rig is made in our own shops, and a royalty is paid the inventor of a certain amount per day for each donkey engine on which one or more of the automatic chokers is used.

RECLAMATION ABOARD.

Irrigation Enterprises in Asia Minor.

The Konia irrigation district is one of the largest and most important irrigation areas in Asia Minor and compares favorably in area with some of the irrigation projects in the United States. Approximately 135,000 acres are under ditch, and about 98,000 acres under cultivation. Individual holdings amount to 135 acres, and peasants can obtain (February, 1920) land either by working on an assigned tract for 15 years or by making specific payments if more prompt ownership is desired. Before the application of irrigation water, land in the Konia Plain was valued at about \$5 per hectare (2.471 acres), but was selling in February, 1920, for about \$125 per hectare. The total increase in value of the lands was \$6,660,000, from which it is evident that the loan of \$3,600,000 made in 1913 for installing the irrigation works was a wise investment. Wheat, barley, and certain varieties of the more hardy fruits are the chief products of the district. The cold is too severe for such crops as rice and cotton. Another serious difficulty is frequent strong winds which often damage and sometimes destroy the growing crops. Windbreaks of hardy trees seem to be the logical solution for the disadvantage, but owing to the lack of fences it is almost impossible to protect the trees during the first few years from destruction by animals, particularly goats, which exist in large numbers on the Konia Plain.

In February, 1920, more land was under cultivation in the irrigation district than before the war. Women have replaced men on the farms to some extent, and the advantages of the irrigated district have attracted settlers from less-favored regions. There has also been a suggestion that Turkish peasants are leaving former Ottoman dominions now under other rule to settle on irrigated farms in Konia and on other irrigation projects under consideration.

The Director of Public Works for the Ottoman Empire in 1915 prepared various plans for irrigation enterprises at an estimated cost of 15,000,000 Turkish pounds. The work as planned consisted of the following projects, with their estimated costs:

	Turkish pounds.
Mesopotamia	5,000,000
Rivers Elloudje and Sherlaa	2,150,000
Improvement of the Rivers Berdan, Seiha, Jelhan, and irrigation works	3,500,000
Aas River	300,000
Kerkook Plateau	350,000
Rivers Kizil-Irmak, Yeshil-Irmak	1,300,000
River Sou-sighirli and dependencies	700,000
River Sakaria, within the Izmit sandjak	350,000
Rivers Menderes and Kedis	1,250,000
Konia irrigation works	100,000
Total	15,000,000

—Commerce Reports.

British South Africa.

On account of the difficulty in securing materials, etc., work on existing irrigation projects during the war period was somewhat retarded and proposed schemes postponed. The Government now proposes to go ahead with its original plans, and anticipates spending \$1,500,000 to \$2,000,000 annually on irrigation during the next 10 years. The most important irrigation project now in course of construction is the Hartebeestpoort Dam across the Crocodile River. The dam is 200 feet high and is the largest and the highest structure of its kind in South Africa; together with the canals, etc., depending on it, it is estimated to cost \$3,000,000. The dam when completed will impound 5,099,000,000 cubic feet of water.

Work on the Sundays River irrigation scheme near Port Elizabeth has been progressing actively during the year. This project provides for the damming of Sundays River with a dam 92 feet high and 1,200 feet long on the crest, thereby creating a huge reservoir with a capacity of 120,000 acre-feet. The estimated cost of this undertaking is \$1,500,000.

The Calitzdorp Dam across the Nels River was completed during the year at a cost of \$800,000. It is 99 feet high and 680 feet long and creates a reservoir with a capacity of 205,034,000,000 cubic feet. The Upper Modder River irrigation scheme is to cost when completed \$2,000,000. The scheme consists of an earthen storage dam and reservoir, with a concrete cove wall on the Modder River at Waterval. Besides irrigating 20,000 acres of land, the city of Bloemfontein will obtain from this source a water supply of 1,000,000,000 gallons per annum. Other smaller municipalities near by will also obtain their water from this source.

On the Kamnassie River in the Cape Province another project of considerable magnitude was commenced during 1919, involving the construction of a huge dam, weirs, and canals, which will cost, when completed, \$2,250,000. It is proposed to bring an area of nearly 30,000 acres under irrigation, and even in the severest droughts, such as the one in 1916, the dam is estimated to hold sufficient water to last a year. The Oliphants River scheme in the Cape Province involves an expenditure of \$2,500,000. It is gradually nearing completion and provides for the irrigation of an area of 30,000 acres.

Various plans for the damming of the Fish River at different points, in order to provide a permanent water supply for irrigating the surrounding country, involve approximately \$2,500,000, while minor projects in course of construction and those contemplated in various parts of the Cape Province and Orange Free State, involving from \$50,000 to \$250,000, have been provided for.—Commerce Reports.

Irrigation in Canada.

Hon. W. A. Buchanan, M. P., in the course of an address at the fourteenth annual convention at Lethbridge, Alberta, made the following statement:

It may be interesting to know of the investment in irrigation in south Alberta and southwestern Saskatchewan. I gathered this from the reclamation surveys at Ottawa. The C. P. R. Lethbridge extension, 130,000 acres; mileage of canals, main, 200 miles; total cost of works estimated at \$2,000,000. The C. P. R. western, with 223,526 irrigable acres, 1,400 miles of canals; total cost of work over \$4,500,000. C. P. R. eastern, irrigable area, 400,000 acres, and the total cost of works estimated at over \$10,000,000.

Canada Land & Irrigation Co., 220,640 acres of irrigable land, with a mileage of canals of 308 miles, and costing nearly \$6,000,000. Smaller projects numbering 660, including a project that might only include half a section, 113 867 acres with an approximate total cost of over \$1,000,000.

It is estimated that the total investment in irrigation, particularly in south Alberta, at the present time, is \$23,460,375, and a total irrigable area of over 1,000,000 acres.—*The Irrigation Review*.

RECLAMATION IN IDAHO.

Mr. R. E. Shepherd, of the Western States Reclamation Association, writing in the New West Magazine, speaks in the following happy vein concerning the Reclamation Service:

To my mind the United States Reclamation Service is better fitted to undertake the work of water conservation than the State or private enterprise, and any plan which did not include this valuable department of the Government would be quite unwise. The work of the United States Reclamation Service has resulted in the development of large areas of desert and semiarid land in a most satisfactory manner. The construction work of the Reclamation Service is certainly a model of excellence. Its research work and study in the problems of land reclamation have been of great value to all engaged in western development. It has already successfully built many large dams in various parts of the West. I know of none that have not in practice come up to the expectations of those dependent upon them.

NOVEMBER WEDDINGS.

November was a banner month for weddings among the employees or former employees of the Washington office of the Reclamation Service. Here they are:

Miss Marion A. Steuart, of Rensselaer, N. Y., and Lawrence H. Cake, former stenographer to former Chief Counsel Will R. King, and now with the firm of Britton & Gray, attorneys, Washington, D. C.; November 16.

Miss Mary E. Boyden, of Lead, S. Dak., and Alonzo M. Stone, formerly a clerk in the Washington office, and on the Belle Fourche project, and now in the employ of the Fruit Growers' Express Co. of Washington, D. C.; November 25.

Miss Jessie G. White, of Washington, D. C., and Ray B. Dame, photographer of the Reclamation Service; November 27.

Miss Kathleen Bingham, of Washington, D. C., former clerk in the Washington office and in the office of District Counsel Egleston, at Helena, Mont., and Dr. Roscoe Stephenson, a professor in the University of West Virginia; November 29.

BULLETINS FOR THE FARMER.

Distributed by the Department of Agriculture, Washington, D. C.

FARMERS' BULLETINS.

- No.
 893 (revised). Breeds of dairy cattle.
 1106. Incubation of hens' eggs.
 1107. Brood coops and appliances.
 1109. Preserving eggs.
 1110. Lice, mites, and cleanliness.
 1112. Cullings for eggs and market.
 1117. Forestry and farm income.
 1133. Feeding garbage to hogs.
 1135. The beef calf: Its growth and development.
 1140. Grasshopper control in the Pacific States.
 1148. Cowpeas: Culture and varieties.
 1151. Alsike clover.
 1152. Sugar-beet seed growing in the Rocky Mountain States.
 1153. Cowpeas: Utilization.
 1157. Waterproofing and mildew proofing of cotton duck.
 1162. Proso, or hog millet.
 1167. Essentials of animal breeding.
 1178. Tree surgery.
 1179. Feeding cottonseed products to live stock.

DEPARTMENT BULLETINS.

878. Varietal experiments with spring wheat on the northern Great Plains.
 888. Results of experiments with miscellaneous substances against chicken lice and the dog flea.
 905. Principles of live-stock breeding.
 912. Hail insurance on farm crops in the United States.
 919. Unit requirements for producing milk in western Washington.

Work and Save. Buy Government Securities.

MONTHLY PROGRESS REPORTS FOR NOVEMBER.

Monthly conditions of principal Reclamation Service reservoirs for November, 1920.

[Elevation above sealevel.]

State and project.	Reservoir.	Available capacity. in acre-feet.	Elevation.		Storage in acre-feet.			Out-flow in acre-feet.	Elevation of water surface.		
			Spill-way crest. ¹	Lowest gate sill. ²	Beginning of month.	End of month.	Maximum.		Beginning of month.	End of month.	Maximum.
Arizona, Salt River.....	Roosevelt ³	1,305,000	2128	1903	952,680	945,347	952,680	7,333	2101.14	2100.62	2101.14
California, Orland.....	East Park.....	51,000	1199.68	1111.68	313	11,947	11,947	.....	1132.55	1168.78	1168.78
Idaho:											
Boise.....	Arrowrock.....	280,000	3211	2956	22,162	29,050	29,190	59,104	3060.8	3071.8	3072.2
Minidoka.....	Lake Walcott.....	177,000	2518	2488	20,610	65,796	65,796	.....	2494.95	2503.95	2503.95
	Jackson Lake.....	95,180	4245	4236	93,320	84,700	93,320	.....	4244.84	4244.1	4244.84
		847,000	6769	6730	183,120	214,390	214,390	.....	6740.03	6741.6	6741.6
Montana:											
Milk River.....	Nelson.....	27,000	2212	2200	21,300	19,300	21,300	1,250	2210.1	2209.3	2210.1
St. Mary Storage.....	Sherburne.....	33,000	4788	4720	5,000	5,000	5,000	.....	4735	4735	4735
Sun River.....	Deer Flat.....	16,700	4130	4085	11,243	11,696	11,696	.....	4124.1	4124.7	4124.7
Nebraska-Wyoming, North Platte.	Pathfinder.....	1,070,000	5852	5670	633,180	670,840	670,840	890	5828.04	5830.6	5830.6
	Lake Alice.....	11,400	4182	4159 ⁴	8,903	7,829	8,903	.....	4178.6	4177	4178.6
	Lake Minatare.....	60,700	4125	4074	50,389	50,191	50,389	.....	4120	4119.9	4120
Nevada, Newlands.....	Lake Tahoe.....	120,000	6230	6224 ⁵	.....	.....	.....	.....	6224.45	6224.55	6224.56
	Lahontan.....	290,000	4162	4060	85,425	100,900	100,900	.....	4132.3	4135.8	4135.8
New Mexico:											
Carlsbad.....	McMillan.....	45,000	3267.7	3241.6	12,500	17,250	17,250	.....	3060.4	3261.8	3261.8
Rio Grande.....	Elephant Butte... ⁶	2,638,800	4407	4321.5	1,750,745	1,744,437	1,750,745	36,379	4381.8	4381.6	4381.8
Oregon, Umatilla.....	Cold Spring.....	50,000	621.5	560	9,150	19,850	19,850	200	583.6	596.94	596.94
Oregon-California, Klamath	Clear Lake.....	462,000	4540	4514	256,000	258,800	258,800	.....	4531.5	4531.66	4531.66
South Dakota, Belle Fourche.	Belle Fourche.....	203,000	2975	2920	139,140	144,340	144,340	4,350	2966.1	2971.1	2971.1
Utah, Strawberry Valley...	Strawberry.....	250,000	7558	7517	193,000	196,000	238,000	.....	7550.3	7550.5	7558
Washington:											
Okanogan.....	Conconully.....	13,300	2287	2232	300	886	886	.....	2242	2248	2248
Yakima.....	Bumping Lake.....	34,000	3426	3389	19,500	19,185	21,635	2,450	3413.9	3413.6	3415.9
	Lake Clealum.....	22,800	2134	2122	14,725	25,805	26,380	575	2129.7	2134.7	2135.04
	Lake Kachess.....	210,000	2253	2192	117,270	124,470	124,470	.....	2232.4	2234.38	2234.38
	Lake Keechelus.....	152,000	2515	2425	22,130	39,765	39,765	.....	2442.3	2455.53	2455.53
Wyoming, Shoshone.....	Shoshone.....	456,600	5360	5132.3	431,688	384,167	431,688	63,206	5356.2	5348.5	5356.2

¹ Or maximum storage.² Or zero storage.³ Zero water depth at elevation 1902.2.⁴ Amount of silt shown by silt survey deducted from original capacity.⁵ Proposed regulation.⁶ Estimated low-water limit under proposed plan of regulation.

SALT RIVER PROJECT, ARIZONA.

Operation and maintenance of irrigation system.—Little water was run in the canals during November, as the demand for irrigation water was light.

Three maintenance crews were in the field during the month; the following statement shows the average number of men and stock employed and the results accomplished: Average number of men, 49½; average number of stock, 6; miles main canals cleaned, 4; miles main canals brushed, 19; miles laterals cleaned, 17; miles laterals brushed, 20; number of new structures installed, 4; number of old structures repaired, 96; riprap placed, 558 feet; dry masonry placed, 30 cubic yards; dirt fill placed, 407 cubic yards; concrete placed, 4 cubic yards; corrugated pipe placed, 86 linear feet; concrete pipe placed, 38 linear feet.

Twelve men and 23 head of stock were used during November widening the Eastern Canal and hauling material for new structures, due to widening; 1,179 cubic yards of dirt were moved; 84 cubic yards of gravel hauled, and 65 cubic yards of concrete placed.

The Marion ¾-yard drag line was engaged in widening the Eastern Canal, moving 1,862 cubic yards of dirt in 12 working days.

The Monighan 2-yard drag line moved 1,192 cubic yards of dirt in 3 working days in widening the Eastern Canal.

The P. & H. ¾-yard drag line continued on berming

the Arizona Canal below Lateral 17, moving approximately 1,335 cubic yards of dirt in a distance of 4,455 linear feet in 12 working days.

The Ruth dredge was engaged in berming the Eastern Canal and Canal 12 South, a main branch of the Eastern. This machine moved approximately 3,400 cubic yards in a distance of 4.7 miles, in 22 working days.

The Austin trencher was engaged in excavating trench for 12-inch concrete pipe in Cross Cut Drain construction. This machine dug 2,875 linear feet in 9 working days. In connection with this work 3,550 linear feet of 12-inch pipe were laid, 260 cubic yards of gravel back fill placed, and approximately 3,000 cubic yards of dirt fill placed.

Work was started on the construction of a number of new pump houses used in connection with sub-drainage. Material was hauled for the first house and foundation placed during the latter part of the month.

Operation of power system.—The total power generated during November was 4,600,444 kw. h.

The Roosevelt power plant operated 91.6 per cent of the month. On November 22 the plant was shut down in order to make necessary repairs to the south spillway of the dam. During this period the machinery and equipment of the plant was overhauled.

The Cross Cut power plant operated continuously during the month, the South Consolidated 97.5 per cent and the Chandler 99.7 per cent. The Arizona Falls

plant did not operate during November owing to the lack of water. The usual winter overhauling and maintenance work was carried on.

Construction work, Phoenix-Mesa telephone line.—The construction of this line was completed early in the month.

Town of Mesa, old plant.—The motor arrived and was installed.

Roosevelt Dam, south spillway.—The work of excavation was carried on aggressively during the month and completed as far as possible above water level prior to shutting the water out of the river. On November 22 the water was shut out and the excavation below water level carried on 24 hours per day and finished on the last day of the month. Forms were in place ready for concrete on November 30.

Office.—A total of 101,825 acres was entitled to irrigation water service on the 1st of the month.—*C. C. Cragin.*

YUMA PROJECT, ARIZONA-CALIFORNIA.

November weather conditions were favorable. Light frosts occurred frequently. The crop of maize was normal, but the acreage was only about 50 per cent normal, owing to extensive planting of cotton. No rain fell during the month.

Construction.—On the East Drain Lateral the Bucyrus dragline advanced 0.2 mile (stations 85 +50 to 96+00), excavating 15,800 cubic yards of material. One culvert was built.

Operation and maintenance.—Three thousand acre-feet of water were delivered to users. Monaghan dragline No. 1 continued work on the Somerton Canal, cleaning 0.65 mile of ditch, stations 11 to 45, involving 10,200 cubic yards of material; Monaghan dragline No. 2 cleaned 0.95 mile, stations 1218 to 1268, of the West Main Canal, moving 9,000 cubic yards of silt. A new Ruth dredger was received and started work in the Yuma Valley on November 19; this machine cleaned 1.5 miles of laterals, moving 1,600 cubic yards of silt.

On the Indian Reservation the old Ruth machine continued work, cleaning 3.3 miles of laterals, moving 3,300 cubic yards of silt.

The maximum discharge of the Colorado River during the month was 12,600 second-feet, minimum 8,000 second-feet. On November 30 the gage height was 16 and the discharge 8,200 second-feet. The total discharge for the month was 619,000 acre-feet.

Boulder Canyon Reservoir.—Drilling at the dam site was continued and the topography taken was plotted in the Yuma office. Topographic surveys below the Boulder Canyon Reservoir site were continued.

Imperial Valley investigations.—Surveys, soil survey, and estimates of costs and irrigable areas were carried on. The report required by the Kinkaid Act was prepared.

Official visitors were Director A. P. Davis, Chief Engineer F. E. Weymouth, Engineer Harold Conkling, A. H. Gullickson, chief accountant; F. St. J. Gebbie and G. Gemmel, Indian Irrigation Service; Prof. Chas. F. Shaw, University of California; and A. T. Strahorn, U. S. Bureau of Soils.—*W. W. Schlecht.*

YUMA AUXILIARY PROJECT, ARIZONA.

During November the engineering party made final location and set slope stakes of the B Main Canal and sublaterals under specifications 388. Final esti-

mate of yardage quantities was computed and overhaul diagram made. Necessary equipment for the construction of the B Lift pumping plant was ordered. A small force commenced on November 24 clearing the brush and mesquite trees from the site of the pumping plant.

The George Co., working under contract for canal construction, made satisfactory progress. Their estimate for the month was 34,000 cubic yards.—*R. M. Priest.*

ORLAND PROJECT, CALIFORNIA.

November weather was unfavorable for outside operations, as there were 11 rainy days during the month. The rainfall at Orland was 4.43 inches, about two and one-half times the normal for the month. Stony Creek, which has been practically dry at Orland since May, 1919, began flowing at the county bridge on the 14th. The run-off of the creek for the month was 54,000 acre-feet, as compared to 2,000 acre-feet for November, 1919. Water for the East Park Feed Canal was available on the 14th, and the operation of the canal was continuous from that date until the close of the month.

Concrete lining was in progress with a force of 45 men and 10 two-horse teams; 11,142 square yards of lining were placed and 1,170 cubic yards of gravel delivered in advance of the work. The maintenance force cleaned and repaired 20 miles of laterals.

The harvesting of milo maize was completed during the fore part of the month. Olive picking continued throughout the month, and the packing of oranges was in progress at its close. Pastures and fall-sown grain were in excellent condition.—*A. N. Burch.*

(Crop report on following page.)

GRAND VALLEY PROJECT, COLORADO.

November weather was favorable for harvesting as well as for project activities. Labor conditions improved toward the end of the month and an ample supply of men and teams was available.

Harvesting was nearly completed by November 30 with perhaps 10 per cent of the sugar beets still undelivered. The pleasant weather afforded opportunity for considerable fall plowing. The prices of farm products continued low with poor markets. A carload of registered dairy cattle was imported through the efforts of the county agent and several were placed with project farmers.

Water was turned out of the canal system on November 1 and work was at once started on the necessary repairs and cleaning of laterals. The Price-Stub pumping plant was closed down and drained in preparation for freezing weather.

Drainage construction was continued with three dragline excavators in the Grand Valley Drainage District. The trenching machine was also started on a short section of the drain in the same area. Approximately 1 mile of open drain was completed, involving a total of 39,000 cubic yards of excavation.

A. H. Gullickson, chief accountant, visited the project on November 29.—*A. W. Walker.*

UNCOMPAHGRE PROJECT, COLORADO.

November was favorable for finishing the harvesting of potatoes and sugar beets and for maintenance work. At the close of the month all crops were harvested, but some beets still remained to be hauled out of the fields.

On November 15 the field work for the crop census was undertaken and completed before the close of the month.

The precipitation in the valley was light during the month, but the snowfall in the mountains during the latter half of October and November was heavier than usual for the season of the year.

General repair work was under way upon the project canals, but the principal maintenance work carried on was the relaying of the concrete floor and side walls on the South Canal below Tunnel 3 and above the seven drops, the cleaning of the C Q Lateral, and the completion of repairs on the Homerun Dam.

The construction of the D E Lateral was undertaken by Government forces during the latter part of the month.

Labor conditions were much better at the end of the month than they have been for the past several years.

A. H. Gullickson, chief accountant, arrived December 30.—*Porter J. Preston.*

BOISE PROJECT, IDAHO.

November weather was mild and damp. Showers occurred at intervals throughout the month. The total precipitation was 1.82 inches, which was about double normal rainfall.

Labor conditions.—The number of unemployed men is gradually increasing. Full crews were maintained without difficulty. In some lines of work there was a slight decrease in the wage scale.

Farming operations.—Fall plowing, clover hulling, and corn harvesting were about completed. Shipments of farm products were very light, owing to unsatisfactory prices. A small amount of hay was sold to local feeders at from \$6 to \$8 per ton in the stack. This is the lowest price that has been obtained for several

years. On the Notus unit, covering about 6,000 acres of land, which is now under construction, the landowners were engaged in clearing and leveling their holdings and a considerable area has been prepared for the coming season's crop.

Water supply.—Rains during the month maintained the flow of Boise River above normal. Reports from the mountains at the head of the drainage basin indicate that the snowfall was heavy for this season of the year and was well packed. To date the indications are promising for next season's water supply.

Operation and maintenance.—From the 4th to the end of the month about 1,000 second-feet were run through the Main Canal for filling Deer Flat Reservoir. No water deliveries were made except during the latter part of the month, when a small amount was run in the laterals to fill cisterns and ponds. Wet weather interfered with canal cleaning. By the last of the month, however, this work was nearly completed. Several crews were engaged in repairing and replacing structures that had deteriorated.

Construction.—Satisfactory progress was made on the Notus Canal. Government forces completed the metal flume across Conway Gulch and installed several concrete turnouts and timber bridges. F. A. Gould and Gus Carlson & Co., contractors for the excavation of the Main Canal, employed fair-sized crews during the entire month. On November 23 bids were opened for the construction of the laterals on the Notus unit, involving the excavation of about 22,000 cubic yards of material. Nineteen proposals were received.

Drainage.—Drag lines Nos. 3 and 4 worked the entire month on the drainage system in the Riverside and Big Bend Districts. Considerable shale was encountered on the Okander Extension Drain which

Preliminary crop estimate, Orland project, California, 1920.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	5,505	Ton.....	13,760	2.5	\$21.00	\$288,960	\$52.50
Other hay.....	924	do.....	1,180	1.3	24.00	28,320	30.68
Pasture.....	3,720					40,440	10.87
Corn, sorghum.....	1,582	Bushel.....	48,000	30.3	1.50	72,000	45.54
Wheat.....	80	do.....	1,360	17.0	1.90	2,585	32.30
Barley.....	1,107	do.....	26,660	24.0	.90	23,995	21.67
Citrus fruits.....	140	Box ¹	3,080	22.0	3.00	9,240	66.00
Deciduous fruits ²	172	Pound.....	412,500	2,400	.04	16,500	95.93
Small fruits.....	20	do.....	30,000	1,500	.15	4,500	225.00
Prunes, dried.....	120	do.....	69,500	579	.08	6,255	52.12
Almonds.....	513	do.....	140,000	273	.20	28,000	54.58
Garden.....	103					12,705	123.35
Nursery.....	12					12,000	1,000.00
Miscellaneous.....	42					4,200	100.00
Less duplicated areas.....	3,000						
Total cropped.....	11,040	Total and average.....				549,700	49.80
		Areas.....			Acres.	Farms.	Per cent of project.
Irrigated, no crops:							
Nonbearing orchard.....	1,990	Total irrigable area farms reported.....			16,185	644	79
Young alfalfa.....	700	Total irrigated area farms reported:					
Not cropped.....	220	Irrigated under water right applica-			13,712	642	67
Less duplicated areas.....	80	tions.....			160	2	.....
		Irrigated under vested rights.....					
Total irrigated.....	13,870	Total cropped area farms reported.....			11,038	644	54

¹Box of oranges weighs 60 pounds.

² Peaches, apricots, plums, etc.

required the use of powder. One small crew was employed in placing structures on this work at the canal and highway crossings. In the Nampa and Meridian Irrigation District two additional relief wells were put down in the water-logged area south of Nampa.

Surveys.—Field work and office studies were carried on in connection with the irrigation of additional lands in the Black Canyon Irrigation District. On the construction, drainage, and operation and maintenance work lines and grades were given and a considerable portion of the lateral system under the Notus Canal was cross-sectioned. The hydrographic data obtained during the past irrigation season were being compiled in the Boise office.

Visitors.—R. F. Walter, assistant chief engineer, on November 13, and Barry Dibble, project manager, Minidoka project, on November 23 and 24.—*J. B. Bond.*

Prevailing crop prices at close of November, 1920.

Project.	Alfalfa hay, per ton.		Bar- ley, per bushel.	Oats, per bushel.	Wheat, per bushel.	Pota- toes, per bushel.
	In stack.	Baled at ship- ping point.				
Salt River.....	\$16-\$20	\$24-\$30	\$1.25	\$0.92	\$2.70	
Yuma.....	20.00	25.00				
Orland.....	18.00	22.00	.80		1.80	
Grand Valley.....	12.00	16.00	1.50	.75	1.45	\$0.60
Uncompahgre.....	8-12		1.50	.70	1.15	.60
Boise.....	6.50	12.00	.50	.65	1.20	.60
King Hill.....	12.00	16.50		.96		1.20
Minidoka.....	7.00	10.00	.56	.40	1.50	.50
Huntley.....	8.00	14.00		.72	1.25	1.80
Milk River.....	10.00	15.00	.38	.23	1.19	1.65
Sun River.....	15.00	20.00	.85	.70	1.17	.95
Lower Yellowstone.....	10.00		.60	.50	1.20	1.00
North Platte.....	6-10			.50	1.50	1-1.30
Newlands.....	12.00	16.00				1.20
Carlsbad.....		21.00				
Rio Grande.....	25.00				1.80	
North Dakota pumping.....						
Umatilla.....	13.00					
Klamath.....	16.00	25.00	.84	.72	1.68	1.80
Belle Fourche.....	6-7	14.00		.48	1.25	1.20
Strawberry Valley.....	17.50	20.00	1.45	1.08	1.80	.90
Okanogan.....	25.00	30.00				1.50
Yakima:						
Sunnyside unit.....	12.50	16-18				.62
Tieton unit.....	12.50	16-18				.62
Riverton.....	10.00			.80	1.05	.90
Shoshone.....	8.00			.60	1.10	.72
Indian projects:						
Blackfoot.....			.34	.30	1.28	
Flathead.....	15.00	20.00		.60	1.20	.75
Fort Peck.....	15.00	20.00		.30	1.14	1.50

KING HILL PROJECT, IDAHO.

The weather during November was normal for this season of the year and favorable for construction work.

At Camp 4 the excavation for the Head End Flume was 84 per cent completed and the concrete work 62 per cent complete.

At Camp 7, 52 per cent of the concrete was placed in the Four Mile Flume, and the inlet of the flume poured.

At Camp 6 the inlet to the McEachren wood-stave flume was concreted and Wasteway No. 11 and the turnout to Lateral No. 4 were completed. Work was

in progress on the 100-inch pipe connection from the McEachren concrete flume to Siphon No. 5.

At Camp 9 the excavation for the Greer lining and the Greer combination flume and lining was 90 per cent completed.

At Camp 10 excavation for Tuanna Siphon was in progress and forms in place for the inlet structure.

The operation and maintenance forces were engaged in cleaning canals and repair to timber structures.

A. H. Gullickson, chief accountant, visited the project on the 1st.—*Walter Ward.*

MINIDOKA PROJECT, IDAHO.

Canal cleaning was hampered considerably by continued wet weather throughout November, but nevertheless good progress was made, and the canal and lateral system at the end of the month was practically ready for next year's irrigation season. Three miles of the project telephone lines have been rebuilt. Transformers arrived for the enlargement of the Burley substation. The floating clam-shell dredge, recently sold to the Imperial Irrigation District, was loaded and shipped.

Little operation and maintenance was done at Jackson Lake. Two men and one team were engaged in hauling timber from the area west of the dike. The warehouse stock was rearranged and inventory taken.

At American Falls six field survey parties were running bench levels, taking topography, and surveying right of way. To the end of the month 84 miles of primary and 155 miles of secondary levels had been run. 7,575 acres of topography on 2-foot contours taken, and 10,260 acres of right of way classified. Two contractors were drilling test holes. A total of nine holes, averaging 80 feet in the river bed and 12 feet depth on the land, were sunk during the month.—*Barry Dibble.*

HUNTLEY PROJECT, MONTANA.

November weather was favorable for field operations. A few days during the early part of the month were cold, the minimum, -9° , occurring.

Labor was more plentiful, and enough was available for all local demands.

Practically all work accomplished was supplemental construction. One check in the Main Canal was completed, 8 drops and checks were placed in Lateral G, and 2 drops and checks in Lateral M; and numerous other small minor structures were replaced with concrete. Work was started on a control section weir in H. D. 5, and was practically completed by December 1.

Operation and maintenance work was limited to work on the Main Canal below McCaffrey's Check, and consisted chiefly in draining borrow pits adjacent to the canal embankments, strengthening the canal banks, raising head walls to cross drainage culvert, and hauling material for grouting a section of canal over this culvert.

Crop reports were being gathered and data compiled in the office.

Meetings were held by the project officials on November 17, 18, 19, and 20, for the purpose of explaining the existing operation and maintenance deficit, and the proposed new supplemental construction work, both of which were to be voted on by the water users on December 1. These meetings were largely attended and a lively interest was evidenced by unit holders.

Farming operations were confined to fall plowing, which, although conditions were unfavorable owing

to excessive dry weather, was carried on to some extent in most lands on the project.

Drainage.—No new work on drainage was started and the Austin machine was put in the yards at Ballantine in preparation for overhauling during the winter.

Backfilling on Drain No. 32 was completed and the machine started for Drain No. 33; the main traction shaft was broken en route, but repairs were not available and no further work was done during the month.

W. J. Egleston, district counsel, attended the meetings of water users on the 17th and 18th.—*Wm. M. Green.*

MILK RIVER PROJECT, MONTANA.

November weather conditions were favorable for construction considering the time of year and latitude. A heavy freeze early in the month prevented further cleaning or enlargement of canals, either by team or machine methods; however, earthwork on lateral extensions was continued to advantage throughout the month. A little fall plowing was done. Considerable hay was baled, but little shipped or sold. Labor conditions improved very much in the first few days of the month, and from that time on there was an ample supply of common labor.

Construction by contract.—Good progress was made on eight small earthwork contracts, four of which were on lateral extensions near Hinsdale, two on lateral extensions near Glasgow, and two on lateral reconstruction and extension of waste-water ditches near Wagner. Construction of the office building for the Saco operation and maintenance headquarters was also in progress.

Construction by Government forces.—Construction of siphon for the NS-116-2-10 Lateral across Beaver Creek, about 6 miles west of Hinsdale, was in progress. Several turnouts, including both vitrified pipe and timber types, were placed, and work was in progress on a few concrete culverts and bridge abutments.

Maintenance and operation.—Several timber checks were rebuilt; a concrete culvert, replacing the flume on the DS-50 Lateral, was built and a portion of the lateral relocated and reconstructed. Refilling holes below the lined section and the outlet works at Rocky Point, mile 8 of the Dodson South Canal, was continued and nearly completed. Considerable work was done in placing rock and brush protection to canal banks on various parts of the project, and some work was done on clearing lateral banks of willows. Collection of data for the annual crop census was in progress.—*Geo. E. Stratton.*

ST. MARY STORAGE UNIT.

November weather was relatively favorable for the construction work being carried on, considering the locality and season. There was only one extremely cold snap, the rest of the month being exceptionally mild.

Construction work was confined to Sherburne Lakes Dam, where the dam embankment and timber spillway flume were completed. Considerable work was done in dismantling, assembling and hauling construction machinery and equipment to Browning, and work was started on clearing the North Hillside slide area. No operation and maintenance work was done on the canal except a small amount of work at the two camps in the way of hauling hay for next year's requirements, looking after stock being wintered there, and miscellaneous work.

The Bucyrus type 30-B gasoline-operated drag line was moved from Cardston to the Canadian customs, and tied up there for the winter.—*R. M. Snell.*

SUN RIVER PROJECT, MONTANA.

The first half of November was cold and windy, but during the latter half excellent weather prevailed.

The work on Pishkun Reservoir dikes was continued with an average force of about 15 men and 22 teams. Good progress was made, and the earthwork for dike No. 3 was about 95 per cent completed at the end of the month. Lining of the Greenfields Canal in Big Coulee was completed early in the month, and the lengthening of the chute drop below Elbow Coulee wasteway was nearly completed at the close of the month. On the Greenfields Division installation and back filling of 34 timber weirs was completed.

On the Fort Shaw Division the main canal and principal laterals were operated from the 18th to 25th, inclusive, to deliver water for domestic use. No water was run in the North Side canal system.

Maintenance work on the Fort Shaw Division consisted of cleaning and raising banks on Lateral C. On the Greenfields Division removal of equipment from camp 14 to Fairfield and Fort Shaw was begun, and at the Fairfield headquarters work continued on the remodeling and repairing of the two cottages moved from camp 14. Some repairs were made on telephone lines.

Farmers completed thrashing and marketed a portion of their grain and potato crops. A small acreage was plowed. There was a marked decline during the month in the prices of grain and potatoes. On the Fort Shaw Division some alfalfa hay was marketed at \$20, baled, f. o. b. shipping point.

There were shipped from Fort Shaw, Simms, and Fairfield during the month 24 carloads of hay, 34 of wheat, 2 of cattle, 9 of sheep, 2 of potatoes, and 1 carload of flax.—*Geo. O. Sanford.*

LOWER YELLOWSTONE PROJECT, MONTANA-NORTH DAKOTA.

The month of November, other than a few days during the second week when below zero weather was recorded, was ideal for maintenance work and for all stock. The cold spell during the second week froze the ground to a depth of 4 inches, terminating fall plowing. The mean temperature of 30.4° was the average for 14 years. The precipitation of only 0.10 inch in the form of snow was 20 per cent of the normal.

The three dragline excavators were in operation throughout the month. Machine No. 1, after completing the removal of silt through the Arkle cut, moved down the canal 1.1 miles in order to move up the canal rather than down, thus eliminating the removal of the ice. This machine moved only 2,300 yards, all of which was under rather unfavorable conditions. Machine No. 2 moved 2,900 yards from 0.4 of a mile of the main canal just below Thomas Point. As weather conditions were favorable, this machine will complete the work below Thomas Point about the middle of December. Machine No. 3, or the Parsons dragline excavator, completed the work of silt removal from the main canal in the vicinity of Sears Creek, or mile 25.3, on the 7th; 2,300 yards of material were moved from the canal prism. The machine was then moved 3½ miles to the extreme lower end of the project, where it was engaged from the 24th to the end of the month at excavating a drain in section 33, township 152 N., range 104 W.; this drain is an outlet to Nohle Lake and is essential in order that water, when necessary, may be wasted in

Four-Mile Creek; 750 linear feet of this drain had been completed, representing 1,780 yards of material.

All maintenance work other than the operation of the dragline machines was discontinued on the 6th owing to the unfavorable weather conditions and the frozen condition of the ground.

A survey party was engaged the entire month on lateral and canal locations under extension, and at the end of the month 41 miles of laterals had been located, approximately one-half of which had been profiled, and the main canal extension, approximating 5 miles, was located, profiled, and cross-sectioned.

The petitions that were being circulated for the securing of signatures to authorize the commissioners of Lower Yellowstone Irrigation District No. 1 to execute a contract with the United States were sufficiently signed to warrant the commissioners to complete the contract. A meeting was called by the president of the commissioners for December 10 for the commissioners to consummate the contract. In North Dakota the directors of Irrigation District No. 2 were less active, although it is believed that they will not delay this matter too long.—*L. H. Mitchell.*

NORTH PLATTE PROJECT, NEBRASKA-WYOMING.

November weather was unusually favorable for farming operations and for operation and maintenance and construction work. The frost in the ground at the first of the month had disappeared and during the last of the month conditions were fine.

Operation.—The Fort Laramie Canal was operated as far as mile 25.5 to furnish water for the Lingle power plant. On account of the small amount of water in the river and the shallow depth in the canal, difficulty was experienced with slush ice. The total diversion was wasted through the sand trap at mile 0.6 from 4 to 7 hours daily to keep down the accumulation of silt in the canal.

Maintenance.—On account of the fine weather it was possible to make good progress in the regular maintenance work on canals and laterals. Considerable repair work, riprapping, and puddling was done in the Interstate and Fort Laramie Canals. On the Interstate unit the forces were cleaning laterals in the Second Lateral District and replacing wooden structures in the First and Second Lateral Districts with concrete. Monighan dragline No. 4 continued work in the Interstate Canal enlargement work, moving 13,435 cubic yards of material during the month to enlarge 4,035 linear feet of canal.

Crops.—The crops census was completed on November 20. The sugar-bee harvest was completed before the close of the month. There is apparently very little market for any of the crops at the present time. Alfalfa hay is selling at \$6 to \$10 per ton in the stack, potatoes at \$1 to \$1.30 per hundredweight sacked f. o. b. shipping point, wheat at \$1.50 per bushel, oats at 50 cents per bushel, and corn at 75 cents per bushel.

Live stock.—There is very little activity in live stock lines. The old feeders are not buying stock for winter feeding on account of the present financial and market conditions. A few farmers who have a large supply of feed with no market for it are feeding a few cattle and sheep. It is estimated that there are only 35,000 sheep and 3,500 cattle being fed at the present time.

Drainage.—Monighan dragline No. 2 continued work on the Lower Nine Mile Outlet Drain, operating with three shifts daily; 9,200 cubic yards of material were

excavated during the month. Dragline No. 3 continued on the Dunham-Andrews Drain, operating with an average of two shifts daily; 15,195 cubic yards of material were moved or 320 cubic yards per shift. The construction forces completed the concrete chute, lateral siphon, 2 highway bridges, and 5 farm bridges, and began work on 3 flumes for lateral crossings.

Tests were made of the Kelly drainage well No. 1 on Dutch Flats, and preparations made for testing wells No. 2 and No. 3.

On the Fort Laramie unit, electric dragline No. 2 continued work on the Cherry Creek Drain, operating with two shifts daily. During the month the machine moved 45,319 cubic yards of class 1 material and completed 1.39 miles of drain. The highway bridge over the drain at station 638 was completed.

Construction.—Interstate unit: Good progress was made by the contractors on the Sheep Creek Diversion Channel and on the contract for graveling banks on the Interstate Canal near Lingle, Wyo.

Fort Laramie unit: Electric dragline No. 1 continued work on the excavation of the East Springer Lateral, operating with two shifts daily, excavating 38,800 cubic yards of material, including 600 cubic yards of class 2, and completing 2.16 miles of lateral. Dragline No. 3 continued work on the Fort Laramie Canal, operating with two shifts daily, excavating 24,742 cubic yards of material, including 1,654 cubic yards of class 2, and completing 0.22 mile of canal. Dragline No. 5 continued work on the Fort Laramie Canal, operating with two shifts daily, excavating 43,760 cubic yards of material, including 600 cubic yards and class 2, and completing 0.91 mile of canal excavation.

The record made by the four electric draglines on the Fort Laramie unit is the best monthly record for four machines since October, 1919. Following is the record of dragline operations for the month and to date:

	Month.	To date.
Number of 8-hour shifts.....	199	3,068
Miles excavated:		
Main canal.....	1.13	7.62
Laterals.....	2.16	44.74
Drain.....	1.39	14.07
Total.....	4.68	66.43
Total excavation..... cubic yards..	15,164	2,179,493
Class 2 excavation..... do.....	2,854	178,429
Class 3 excavation..... do.....	0	1,000
Average cubic yards per shift.....	761	710
Kilowatt-hours used.....	84,000	1,147,100
Average kilowatt-hour per cubic yard.....	0.55	0.50

The powder crew drilled 3,673 linear feet of holes and used 5,100 pounds of T. N. T. in blasting classified material.

Good progress was made on the construction of the Horse Creek Wasteway at mile 67.5 of the Fort Laramie Canal. During the month 191 cubic yards of concrete were placed in this structure. Good progress was also made on the construction of the Howard Siphon at mile 62.6, the Emery Siphon at mile 61.8, the highway bridge at mile 61.8, and the Springer Lateral Headgate at mile 62.0.

Work was continued on the construction of the Lateral 35.4 Siphon. During the month 79 lengths of 30-inch concrete pipe and 89 lengths of 33-inch pipe were manufactured and 17 lengths of 33-inch pipe placed.

Work was continued on the construction of minor structures on laterals. During the month, 2 checks, 4 tunnels, 4 weirs, and 1 road crossing were completed.

Good progress was made on all contract work.

Northport District: Work was continued by the elevating grader outfit operated by Government forces on the construction of fills on the Northport Canal. During the month 11,000 cubic yards of material were placed in fills. Electric dragline No. 4 continued work on the excavation of the Northport Canal, operating with two shifts daily, excavating 38,129 cubic yards of material, including 2,298 cubic yards of class 2 and completing 1.42 miles of canal. Power for operating the machine is obtained from the Bridgeport power plant and 17,404 kilowatt hours were used during the month.

Good progress was made by the construction forces on the construction of concrete lateral structures. Work was started on the excavation for the Indian Creek Siphon on the Northport Canal.

Good progress was made on the contracts for lateral excavation.

Power system.—The Lingle power plant was operated continually throughout the month with three shifts daily. In addition to the power used for construction purposes, 1,200 kwh. were delivered to Lingle, Wyo., 30,700 kwh. to Torrington, Wyo., 12,700 kwh. to Morrill, Nebr., and 28,100 kwh. to Mitchell, Nebr.

Surveys.—Work was continued on the location of the lateral system to furnish water for the irrigation of the land in the Upper Cherry Creek Valley and on the irrigable area surveys for land under the Springer Lateral system on the Fort Laramie unit.

Settlement.—The Interstate Commerce Commission has authorized the Union Pacific Railroad Co. to construct an extension of their present lines into the Goshen Hole on the Fort Laramie unit with a spur track extending down the Cherry Creek Valley, the work to be completed on or before December 31, 1921. Charters have been applied for for three banks to be

located at Springer, Wyo., and Caldwell and Lyman, Nebr., new towns along the extension. Several business buildings have already been started at Lyman, Nebr., which is just east of the Nebraska-Wyoming State line.—*H. C. Stetson.*

NEWLANDS PROJECT, NEVADA.

November weather conditions were favorable for maintenance and other work. A small amount of precipitation occurred.

The project manager was in San Francisco from November 2 to 5 and from November 9 to 14 in connection with the suit of John E. Bennett v. the United States as the outcome of negotiations for Lake Tahoe rights of way. This suit was dismissed by the Federal court.

November 5, Chief Accountant A. H. Gullickson and Examiner of Accounts F. G. Hough arrived. Mr. Gullickson remained on the project until the 7th. Mr. Hough completed an inspection of the project and left on November 25.

On November 13, Project Manager Barry Dibble of the Minidoka project, Electrical Engineer J. M. Gaylord, and Mr. Shippee of the Strawberry Valley project arrived in Reno to testify for the United States regarding water requirements in power canals for ice and debris flushing purposes in connection with the Truckee River water-right adjudication suit, which reopened on November 15.

Numerous oil and gas prospecting permits on project and adjacent lands were issued by the General Land Office during the month. A number of drilling outfits continued in active operation in search of oil.

Construction.—The reconstruction of the lower bank of Truckee Canal over a length of about 4.160 feet, west of Hazen, Nev., was the most important construction work in progress during the month. A drag-line excavator is being used for this work.

On November 3 bids were opened for the construction of the Rabjohn Lateral, about 3,025 feet in length, in the T system. A low bid of 14 cents per cubic yard was received.

Preliminary crop estimate, Newlands project, Nevada, 1920.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa	26,540	Ton.....	92,819	3.5	\$14.00	\$1,299,470	¹ \$48.95
Barley	769	Bushel....	22,500	29.26	1.00	22,500	¹ 29.25
Garden and miscellaneous crops.....	650					53,470	¹ \$1.89
Oats	68	Bushel....	3,375	49.63	.64	2,160	¹ \$1.76
Potatoes	354	do.....	36,800	103.95	1.20	44,160	¹ 124.69
Wheat	3,586	do.....	91,533	25.53	1.85	169,340	¹ 47.22
Hay (grain).....	505	Ton.....	751	1.49	14.00	10,510	20.82
Alfalfa (seeded 1920).....	4,254	do.....	581		14.00	8,130	1.91
Pasture (wild grass).....	9,720					28,340	2.91
Pasture (alfalfa after cutting).....						48,320	
Less duplicated areas.....	1,876						
Total for acreage in full production.....	31,970	Total and average.....				1,591,100	¹ 49.76
Total cropped.....	44,570					1,686,403	37.83
		Areas.			Acres.	Farms.	Per cent of project.
Irrigated without crop.....	1,040	Total irrigable area farms reported.....			69,984	742	36.45
Total irrigated.....	45,610	Total irrigated area farms reported.....			45,610	742	23.75
		Total cropped area farms reported.....			44,570	742	23.21

¹ Crops in full production.

An oil-loading platform, a lumber saw rig, and other minor conveniences were installed at the project yards.

Surveys and investigations at Spanish Springs Valley reservoir and dam sites were continued with diamond drilling and taking of topography.

Irrigable area surveys were made covering about 10 farm units proposed for opening to entry at an early date.

Water supply and use.—Storage in Lahontan Reservoir increased to 100,900 acre-feet at the end of the month. The surface of Lake Tahoe rose one-tenth of a foot to elevation 6,224.55 feet, the only drafts, in amount of about 6,746 acre-feet, being for Truckee River power-plant operation.

Operation and maintenance.—An estimate of the operation and maintenance work to be done during 1921 was completed.

Labor conditions were greatly improved, with an ample supply of efficient labor available.

About 3.5 miles of laterals were cleaned, and willows and brush were cleared from about 6 miles of canals and laterals by the ditch riders.

Repairs to buildings were made at several of the ditch-riders stations, and an area of about 2 acres at the N Lateral ditch-tenders station was leveled for cultivation.—*John F. Richardson.*

CARLSBAD PROJECT, NEW MEXICO.

November weather was characterized by cool nights and warm days, except a few cloudy cool days about the middle of the month. The first killing frost of the season occurred on the 12th. The total run-off of the Pecos River averaged 207 acre-feet per day, or 12,340 acre-feet for the month. The maximum flow was 593 acre-feet and the minimum 379 acre-feet.

Work accomplished included the hauling of drain tile from the various storage yards near Otis to the central yard at Carlsbad, and the improvement of storage facilities at that yard.

The labor on the project was employed principally in cotton picking. There was enough labor for this work at an average price of \$1.75 per hundred pounds of cotton.

Owing to the increase in freight rates and the restricted demand, very little alfalfa hay is being sold except for local consumption. The prices offered at the end of the month averaged about \$20 per ton. There was practically no sale for alfalfa seed; this season's crop is being generally held on the project for market. There were a few sales running 12 cents per pound f. o. b. the project. There was a total of 3,683 bales of cotton ginned at the end of the month, which included the total season's ginning. Contrary to the general opinion, the yield of cotton will be much lighter than last season. This is due in part to late replantings in the spring and to the cold weather lasting about three weeks in October. There was very little development of cotton during that period, which did not become evident until after the killing frosts in November, when it became apparent that the top crop would not mature as had been expected. The price for long staple cotton has been continually downward during the month; a few sales were made at prices ranging from 28 to 18 cents, and in some cases lower. The demand at present is practically nil at any price. Owing to the outlook for the cotton market and the low prices being obtained for range cattle, financial conditions in this vicinity are critical. Most farms on the project will

have been operated at a loss for the season of 1920. Shipments totaling 787 bales of cotton were reported for the month. This cotton was shipped principally to New Orleans to be held for the market to improve. Cotton seed was selling at \$15 per ton to the mills. As the season advances it is hard for the gins to dispose of surplus seed, even at the lowest price in a decade. About 60 per cent of the total cotton crop had probably been picked at the end of the month.—*L. E. Foster.*

RIO GRANDE PROJECT, NEW MEXICO-TEXAS.

November temperature was about 2 degrees above normal although there were several cold nights. The inflow into the reservoir at San Marcial was steady, the total for the month being 46,114 acre-feet.

The gates at Elephant Butte Dam were opened on November 1 for a 15-day run of water, but the run was continued for several days to enable the farmers to water the winter wheat. A flow of 1,050 second-feet was maintained. Besides being used for irrigation purposes the water was run through the canals in an endeavor to sluice out the sand. In this way about 1,000 cubic yards of sand were taken out of the Chamberino Canal, and a considerable amount of sand was also sluiced out of the West Side Canal through the new wasteway from the La Union Canal.

Surveys were being made to determine the amount of yardage to be moved during the annual cleaning of canals.

Field work on collection of crop data was about completed and the work of compiling was 75 per cent complete. The sweet potato storehouse at Las Cruces was filled. One and one-half tons of turkeys were sold through the Farm Bureau Marketing Association at Las Cruces at 37 cents per pound to the owner.

Construction activities on the project consisted of work on the storage, distribution, and drainage features. At Elephant Butte the installation of the construction plant and roads preparatory to beginning the construction on the spillway and embankment paving continued, and trimming of the embankment slope was begun.

A number of dragline excavators were employed during the month on canal and lateral work, three of these being in the Mesilla Valley and one in the El Paso Valley. As it is planned to accomplish considerable canal work during the nonirrigation period, as many of the draglines as possible will be utilized on this work.

A set of plans for the Franklin Canal headgate enlargement and skimming weir were received from the Denver office and the construction of this feature will begin immediately. The construction of the Montoya Siphon will also begin as soon as materials can be delivered to the site.

Drainage construction continued with one dragline excavator in the Rincon Valley, two in the Mesilla Valley, and two in the El Paso Valley. To date 187½ miles of open drain have been constructed on the project, making the drainage system 60 per cent complete.

A. H. Gullickson, chief accountant, stopped on the project for a short visit on November 17. Other visitors to the project during the month were: F. St. J. Gebbie, Chief of the Irrigation Department of India, and G. Gemmel, Executive Engineer, of England; Lieut. Herman Jansson, of the Corps of Royal Engineers of Sweden; and Señor Carlos Volpi, one of the principal engineers in the Irrigation Service of Argentina. These engineers visited Elephant Butte Dam and other points of interest on the project.

Roland Harwell, manager of the El Paso County Water Improvement District No. 1, has gone to Mexico to investigate the pink boll worm conditions in the Lagunas District in Torreon.—*L. M. Lawson.*

NORTH DAKOTA PUMPING PROJECT.

November weather conditions were unusually good for all operations except earth work. By the middle of the month the ground was too deeply frozen for ditch repairs. The precipitation was 0.09 inch, which was 0.51 inch below normal and makes an accumulated deficiency of 1.43 inches since January 1.

The principal maintenance work was on the pumping barge and on boilers and piping system of the power house. In the coal mine a pumping system was installed to replace the one buried two months ago in a coal "creep." Timbering and track work was caught up and wet places unwatered.

Labor gave evidence of becoming more plentiful, but there was no reduction in wages.

The power plant was operated for the commercial power contract; 120,200 kilowatt-hours of electrical energy were delivered to the city of Williston. This is the largest commercial power demand in any one month during the life of the contract. It represents an increase of 14,889 kilowatt-hours over the same month of last year.

One thousand and thirty-two tons of coal were mined.—*Wm. S. Arthur.*

UMATILLA PROJECT, OREGON.

November weather conditions were characterized by a low mean temperature.

Farming operations were limited. A small amount of hay was baled, and some land was leveled and prepared for seeding.

Labor conditions were not difficult, settlers on the project furnishing all the help needed on construction work.

Practically no maintenance work was done on the East Side during the month. On the West Side the work performed included minor repairs to structures, improvement of grounds at the patrolman's quarters, and sluicing operations.

The Feed Canal was operated throughout the month, diverting from 171 to 260 second-feet. From 5 to 30 second-feet and from 146 to 215 second-feet were delivered continuously throughout the month to the Echo Mills and Cold Springs Reservoir, respectively. At the close of the month approximately 20,000 acre-feet had been stored, being an unprecedented record for early storage.

Office work connected with the crop census was completed and water records were being tabulated and checked preparatory to the annual report.

Small construction work involved the laying of 584 linear feet of 16-inch cement pipe, and the installation of five minor structures in supplemental construction district No. 33, the laying of 286 linear feet of 16-inch cement pipe and 370 linear feet of 20-inch pipe in supplemental construction district No. 34, and the installation of one minor structure each in districts Nos. 25 and 32. Approximately 430 linear feet of 12-inch pipe were placed on Lateral 000 on the West Side.

Placing of concrete lining on Canal A was continued until the 6th, when low temperatures rendered further lining inexpedient, and most of the crew was laid off. On the 16th the weather became

Preliminary crop estimate, North Dakota pumping project, 1920.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	170	Ton.....	196	1.15	\$20.00	\$3,920	\$23.02
Barley.....	102	Bushel.....	2,597	25.46	.64	1,662	16.29
Beans.....	4	.....do.....	34	8.50	6.00	204	51.00
Beets, sugar.....	1	Ton.....	13.25	16.10	12.00	159	193.20
Buckwheat.....	.5	Bushel.....	8	16.00	2.25	18	36.00
Clover hay.....	20	Ton.....	38	1.90	20.00	760	38.00
Corn.....	55	Bushel.....	1,485	26.88	1.00	1,485	26.88
Corn fodder.....	133	Ton.....	602	4.54	15.00	9,030	68.10
Flax.....	59	Bushel.....	397	6.72	2.30	913	15.46
Garden.....	55	Acre.....				12,555	226.70
Hay, blue joint.....	397	Ton.....	335	.85	22.00	7,370	18.70
Hay, millet.....	340	.....do.....	541	1.59	18.00	9,738	28.62
Hay, oat.....	114	.....do.....	154	1.35	18.00	2,772	24.30
Hay, Sudan grass.....	20	.....do.....	19	.95	18.00	342	17.10
Oa's.....	615	Bushel.....	21,178	34.45	.36	7,624	12.40
Onions.....	.5	.....do.....	125	250.00	3.00	375	750.00
Pasture.....	263	Acre.....				1,668	6.30
Potatoes.....	109	Bushel.....	10,980	101.20	1.50	16,470	151.80
Speltz.....	3	.....do.....	60	20.00	1.70	102	34.00
Sudan grass seed.....	5	.....do.....	8.50	1.70	30.00	255	51.00
Wheat.....	330	.....do.....	5,032	15.26	1.86	9,358	28.38
Less duplicated areas.....	58						
Total cropped.....	2,738		Total and average.....			86,780	31.70
Irrigated, no crops:			Areas.		Acres.	Farms.	Per cent of project.
Young alfalfa.....	515				4,758	94	62
Young sweet clover.....	157				2,808	94	37
Young brome grass.....	17				2,738	94	36
Miscellaneous.....	25						
Less duplicated areas.....	644						
Total irrigated.....	2,808						
			Total irrigable area farms reported.....		4,758	94	62
			Total irrigated area farms reported.....		2,808	94	37
			Total irrigated area farms reported.....		2,738	94	36

warmer, and concreting was resumed with a small crew, and was continued with a few short interruptions until the close of the month. A total of 659 cubic yards of concrete was placed. Operation of the gravel pit was continued until the 12th, when the plant was closed down and dismantled preparatory to moving farther down the canal. Excavation on canal enlargement was discontinued on the 4th, at which time the enlargement had been completed well ahead of the point set for the close of the season's concreting.

One car of hogs was shipped to the Portland market by George Strohm. These hogs were first shown at the Pacific International Live Stock Show at Portland and took first prize. This is the second year that Mr. Strohm has competed and carried away the honors. Over 9 tons of honey were shipped in less-than-carload shipments during the month.

Assistant Chief Engineer R. F. Walter visited the project on November 11.—*Maurice D. Scroggs.*

KLAMATH PROJECT, OREGON-CALIFORNIA.

The precipitation for November was 3.64 inches, being the greatest for this month since 1911. The greater part of the month was cool and cloudy; there were 10 days on which precipitation occurred. In general, the month was unfavorable for construction and for farm work, particularly thrashing. The water surface in Tule Lake was 0.6 of a foot higher at the end than at the beginning of the month. Owing to the wet weather little thrashing was done during the

month, and a considerable portion of the project grain crop remained to be thrashed.

On the Tule Lake lands thrashing is still in progress, but has been slow on account of weather conditions. The marketing of the grain crop from the 13,000 acres of the Tule Lake leased lands is essentially a hauling problem, as it is necessary to haul the grain to Klamath Falls, a distance of about 30 miles. All of the grain is sacked as soon as thrashed and stored in large piles out in the open and frequently without cover of any kind. The number of motor trucks available for hauling is very limited. A large portion of the grain, therefore, still remained to be hauled and some of it has been spoiled by wet weather. A large number of cattle, sheep, and hogs are being pastured on the grain stubble.

Three small crews were engaged all month in making repairs to structures on the distributing system. One of the principal jobs has been the repairing of about 800 feet of timber flume on the North Poe Lateral.

The concrete lining job on the C Canal was completed on November 24. During the month 2,240 feet of the concrete lining were completed, which involved the placing of 633 cubic yards of concrete. About 50 men were employed on this job. The total length of the concrete lined section is 7,555 feet, of which 2,250 feet were placed during the fall of 1919, and 5,305 feet during the fall of 1920. The above work was to replace a timber lining constructed in 1908-9.

Preliminary crop estimate, Umatilla project, Oregon, 1920.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	8,512	Ton.....	32,110	3.7	\$13.71	\$440,230	\$51.72
Alfalfa seed.....	34	Bushel.....	106	3	21.52	2,282	67.12
Apples.....	652	Pound.....	374,690	575	.041	15,362	23.56
Barley.....	8	Bushel.....	350	44	1.16	406	50.75
Corn (Indian).....	124	do.....	3,740	30	1.34	5,012	40.42
Corn fodder.....	100	Ton.....	601	6	6.42	3,858	38.58
Fruits, small.....	30	.....	.....	.....	.....	2,843	94.77
Garden.....	143	.....	.....	.....	.....	22,120	154.69
Hay.....	335	Ton.....	335	1	11.81	3,956	11.85
Pasture.....	422	.....	.....	.....	.....	12,722	30.15
Peaches.....	50	Pounds.....	Failure.....	.....	.....	.....	.....
Pears.....	7	do.....	.....	.....	.....	.....	.....
Prunes.....	2	do.....	6,660	3,330	.05	333	166.50
Potatoes.....	48	Bushel.....	4,203	88	2.03	8,532	177.75
Rye.....	10	do.....	110	11	1.60	176	17.60
Wheat.....	20	do.....	240	12	2.20	528	26.40
Miscellaneous.....	33	.....	.....	.....	.....	1,110	33.64
Less duplicated area.....	340	.....	.....	.....	.....	.....	.....
Total cropped.....	10,190	Total and average.....	.....	.....	.....	519,470	60.00
Irrigated, no crop:							
Nonbearing orchard.....	104	Areas.....			Acres.	Farms.	Per cent of project.
Young alfalfa.....	1,523						
Miscellaneous.....	350						
Less duplicated areas.....	137						
Total irrigated.....	12,030	Total irrigable area farms reported.....			18,568	528	66.1
		Total irrigated area farms reported.....			12,028	528	42.8
		Irrigated under water-right applica- tions.....			10,528	449	37.5
		Irrigated under rental contracts.....			179	7	.6
		Miscellaneous.....			1,132	82	4.7
		Total cropped area farms reported.....			10,188	528	36.3

¹Vested water right, 108 acres; departmental regulations, 51.5 acres.

²10 farms duplicated. Maxwell rental contracts, 405.75 acres; sandy area rental, 757.2 acres.

Upon the completion of the lining job most of the construction crew were layed off. A small force, however, was being employed in moving the camp to the flume job and in making preparations for the work to be done next year.

During the month the Monighan excavator No. 122235 was engaged in the construction of drains for the Upper Van Brimmer Drainage District. From the 1st to the 8th the machine constructed Drain No. 1 from station 0 to 9, which involved the excavation of 4,000 cubic yards of material. From the 9th to the 22d the machine was being overhauled and camp was moved. From the 23d to the 30th of the month the machine constructed Drain No. 2 from station 0 to 12+50, which involved the excavation of 5,863 cubic yards of material of which 400 cubic yards was class 2.

One small survey party was engaged all month in running out the shore line of Tule Lake and in giving grades on the lining job.

Bids for the leasing of the Tule Lake lands, for the season of 1920, were opened on November 9; 145 lots were advertised, the total area being about 13,000 acres. One hundred and seventy-nine bids, ranging from 50 cents to \$8.20 per acre, were received. Ninety-three lots were leased, and the remainder will be readvertised in the spring. No water for irrigation is available for the Tule Lake lands. Pending the construction of irrigation works the lands are being leased for a period of one year, the consideration being a cash rental, payable in advance.

A hearing was held from the 18th to the 20th before a committee appointed by the Klamath County Chamber of Commerce to consider the merits from the point of view of the general public of the contract of February 24, 1917, between the United States and the California-Oregon Power Co. The contract provides for the construction of a dam at the head of Link River by the power company and the regulation of the Upper Klamath Lake. A copy of the report of the committee, setting forth the findings of fact and their recommendations, has been forwarded to the Secretary of the Interior by the Klamath County Chamber of Commerce.

R. F. Walter, assistant chief engineer, visited the project on November 1 and 2, and H. L. Holgate, district counsel, from November 18 to 21. Herbert D. Newell, project manager, left Klamath Falls for Washington, D. C., on November 23.—*E. C. Koppen.*

BELLE FOURCHE PROJECT, SOUTH DAKOTA.

The first half of November was blustery and cold. The month started in with a heavy snow over the project and with minimum temperatures from 1 to 4° below zero. Melting snow in the daytime and hard freezing at nights rendered the roads impassable for heavy hauling and impracticable for automobile travel. Toward the end of the month the weather warmed up, and with abundant sunshine roads dried up and farmers were able to resume the hauling of hay to market. Old timers in the country are predicting a warm open winter.

Water was delivered through the Inlet Canal to the reservoir continuously throughout the month. On the 21st water was turned into the North Canal and laterals for stock purposes. The gates were open for one week. The weather was moderate and little trouble from ice jams was experienced. At the beginning of the month the ground was covered with snow from 6 to 12 inches in depth, which stopped all maintenance work for the time being. By the 15th the snow had gone, and although roads were in bad

condition it was possible to resume structure maintenance. The 5-foot diameter concrete culvert under the North Canal was completed and back filled and back filling of the Townsite Lateral concrete siphon was almost completed. One hundred and fifty-five feet of 18-inch sewer-pipe siphon across the United States experiment farm was incased in 4 inches of reinforced concrete to stop leakage; 14 minor structures (wood) were built; the substructure of one 25 second-foot capacity steel flume on the lower end of Indian Creek Lateral was rebuilt, and lumber hauled for repairing another of the same capacity. These flumes are each about 150 feet long. Twenty-five cubic yards of gravel were hauled for replacing with concrete a wooden chute in the Vale Lateral, and two carloads of lumber were hauled from Fruitdale to Orman.

The survey party previously engaged on Willow Creek work disbanded the latter part of October and no field work was done in November. Drilling of test holes on Chicken Creek Reservoir site was begun on October 3 and completed on November 9. Four holes were drilled, each to a depth of 150 feet. The only variation in material found from that encountered in previous drilling was in the hole near the south end of the reservoir where 4.5 feet of limestone was encountered at a depth of 131 feet. With this exception the material penetrated was the ordinary red rock found in that vicinity.

Practically no maintenance work will be attempted before the opening of spring except repairs to small structures conveniently located with reference to headquarters. The foremen in charge of maintenance districts will be engaged in repairing equipment and preparing material for next spring's work.

Hay was being baled and loaded on cars at \$14 per ton. The cost of baling is \$4 per ton and of hauling from \$2.50 to \$5, depending on location. Hay in the stack was selling at \$6 to \$7 per ton, with very few sales. Wheat had dropped to \$1.25 per bushel for No. 1 Marquis and oats were \$1.50 per hundredweight. Project stock was in good condition, but the market was flat. Hogs brought from 6 to 7 cents locally and fat cows about the same price. Everything except sugar beets was selling far below the cost of production, and most farmers will have hard sledding to pull through and pay their bills.—*B. E. Hayden.*

STRAWBERRY VALLEY PROJECT, UTAH.

The forepart of November was stormy, the latter part generally fair.

Farming operations.—The harvesting of all the crops on the project was practically completed during the month with the exception of the sugar beets, which were about 85 per cent harvested.

Labor conditions.—Common labor and teams were scarce during the forepart of November, but during the latter part the situation eased somewhat, so that this class of labor was ample for all requirements. Skilled labor also was fairly plentiful throughout the month and no great trouble experienced in obtaining an adequate supply.

Operation and maintenance, storage system.—Operations at the West Portal of Strawberry Tunnel were continued throughout the month, and consisted mainly in quarry work and installing the new rolls and the new 50-horsepower fuel engine for the operation of the crushing plant. Sand heaters were put in and the tunnel bulk head and 14-inch pipe tried out preparatory to starting actual concrete work on the floor.

Concrete work was started on the last day of the month and 80 feet of new floor placed.

Hydroelectric power plant operation.—Final plans for the alterations to the exciter units were received from the Denver office and checked prior to placing the order.

General.—Collections on construction and operation and maintenance charges in the sum of \$126,000 commenced on November 15, and on the last day of November 70 per cent of the collections had been made.

The main leases between the United States and the Strawberry High Line Canal Co. and the sublease of the Strawberry Grazing Co. were executed during the month.—W. L. Whittemore.

Project weather during November, 1920.

Project.	Station.	Temperature, ° F.			Precipitation (inches).
		Maxim.	Minim.	Mean.	
Salt River.....	Phoenix, Ariz.....	79	33	58.6	T.
Yuma.....	Yuma, Ariz.....	82	40	60.6	.....
Orland.....	Orland, Calif.....	71	33	51.8	4.43
Grand Valley.....	Grand Junction, Colo.....	59	20	39.8	.67
Uncompahgre.....	Montrose, Colo.....	65	15	41	.17
Boise.....	Boise, Idaho.....	60	22	40.8	1.82
King Hill.....	Glenns Ferry, Idaho.....	60	14	37	1.89
Minidoka.....	Burley, Idaho.....	56	13	35	1.07
Huntley.....	Ballantine, Mont.....	56	- 9	30.1	.14
Milk River.....	Malta, Mont.....	60	- 6	29.5	.02
St. Mary storage.....	Near Babb, Mont.....	54	-15	34.5	.21
Sun River.....	Fort Shaw, Mont.....	58	-18	32.6	.07
Lower Yellowstone.....	Savage, Mont.....	60	- 3	30.4	.10
North Platte.....	Wyncoke, Wyo.....	68	1	33.3	.02
Newlands.....	Fallon, Nev.....	66	13	.....	.43
Carlsbad.....	Carlsbad, N. Mex.....	82	19	38.5	.58
Rio Grande.....	El Paso, Tex.....	75	24	51.6	T.
North Dakota pumping.....	Williston, N. Dak.....	54	- 3	28	.09
Umatilla.....	Hermiston, Oreg.....	60	13	38.1	.82
Klamath.....	Klamath Falls, Oreg.....	55	15	36.2	3.64
Belle Fourche.....	Orman, S. Dak.....	67	- 2	31	1.01
Strawberry Valley.....	Provo, Utah.....	65	17	38.7	1.25
Okanogan.....	Omak, Wash.....	57	18	39.4	2.97
Yakima:					
Sunnyside unit.....	Sunnyside, Wash.....	61	16	40.5	1.3
Tieton unit.....	Cowiche, Wash.....	54	22	38.8	1.57
Riverton.....	Diversion Dam, Wyo.....	48	-11	22	.09
Shoshone.....	Powell, Wyo.....	62	4	29.1	.01
Indian projects:					
Blackfeet.....	Browning, Mont.....	47	-18	27	T.
Flathead.....	St. Ignatius, Mont.....	61	6	34	.29
Fort Peck.....	Poplar, Mont.....	58	- 7	28.8	.14

OKANOGAN PROJECT, WASHINGTON.

The first half of November was cold and cloudy with north winds. During the latter half considerable rain fell. The rainfall at Omak amounted to 2.97 inches and at Conconully to 2.61 inches.

The building of the machine shop was continued, and at the end of the month was nearly completed. The master mechanic with one helper overhauled the pumping-plant machinery. Two men were employed on repairs and replacements of wooden structures on the distribution system.

The inflow into Conconully Reservoir for the month amounted to 586 acre-feet, which is above normal for November. There was little movement of the apple crop, as prices were low and those in storage were being held for an advance in prices.

Assistant Chief Engineer R. F. Walter was on the project from November 6 to 9. During his visit in-

spection was made of the work at Conconully and the proposed dam site at McLaughlin rapids on the Okanogan River, and the financial situation and cost of the operations for the year were carefully gone into.—Calvin Casteel.

STORAGE UNIT.

November weather was comparatively mild with considerable precipitation, especially during the last week of the month. At the end of the month the ground had a light covering of snow and was not frozen except in a few shaded locations. Labor was plentiful throughout the month.

A team crew was worked, one shift per day, on the Salmon Lake Dam embankment, placing 6,716 cubic yards of earth embankment and 487 cubic yards of riprap on the upstream slope.

At Conconully Dam, 422 linear feet of the reinforced concrete parapet were completed during the month. The foundation trench on both sides of the completed wall was back filled.

The Salmon Lake Road was practically completed; a small labor crew, working throughout the month, excavated by hand methods 961 cubic yards of class 1, 640 cubic yards of class 2, and 266 cubic yards of class 3 material; this practically completes this road.—L. V. Branch.

YAKIMA PROJECT, WASHINGTON.

The prevailing weather for November was about normal, with precipitation slightly above normal. The latter half of the month was favorable for all field work. On the morning of the 28th a distinct earthquake occurred, which was felt at all the storage dams, but no apparent damage was caused.

Operation and maintenance, Sunnyside unit.—The irrigation season closed on October 31, and as soon as the canal system had been drained, maintenance work was started, consisting of sloping of main canal banks preparatory to placing gravel riprap, trimming of berms, clearing of weeds, grubbing of willows, replacement of worn-out structures with concrete, and other general improvements. One crew of 5 men and 2 trucks was occupied the greater portion of the month with repairs and improvements around Zillah headquarters, and the construction of a third crib on the river side of the main canal below the diversion dam. A crew of 12 men constructed three large turnouts and checks on the Mabton Canal, and removed the old structure and completed the excavation preparatory to replacing with concrete the turnout and chute at Mabton 6.40. Gravel was delivered for riprapping main canal banks. It is proposed to riprap about 2 miles of the canal this season. Excellent progress was made on all work, and at the close of the month all teamwork was discontinued.

Tieton unit.—Maintenance work consisted of removal of silt from canals, cleaning of weir pools, cutting weeds and grubbing willows on sublateral, making minor repairs to turnout gates and farm-delivery boxes, and replacing small pipe lines. Rainy weather interfered with progress, but by the 20th of the month, when water was turned on for the filling of cisterns, the fall program had been about 80 per cent completed. Good progress was made on the rebuilding of North Fork Tunnel, the pouring of concrete being completed on the 12th. Placing of plaster lining on the floor of Tieton Tunnel was discontinued on the 13th in order to permit running of cistern water a week later. At that time about 350 linear feet of tunnel remained to be plastered. Chisel work

in the North Fork Tunnel, preparatory to placing of plaster lining, was completed on the 19th. Good progress was made on the construction of two 5-room cottages at Tieton headquarters by the contractor, F. C. Howard.

Investigations and surveys for new units.—A location party of 8 men was engaged upon the Razo unit main canal and alternate location lines until the 29th, when work was resumed on location of Moxee unit main canal. A test-pit crew completed pits on 5 miles of the Moxee unit line and on 6 miles of the Roza unit canal in East Selah Valley. An office force of 5 men continued the cost estimate for the Moxee unit and handled computation and platting of field notes, profiles, etc., for the Roza unit.

Storage unit.—At CleElum crib dam about 300 concrete blocks (size 2 by 2 by 2 feet) were placed in a hole that had been washed at the toe of the apron. Some repairs were made to the right-crib abutment and broken plank on the spillway were replaced. At Kachess Dam a careful inspection was made of the dam and outlet works; 200 second-feet were released from Kachess Reservoir up to the 17th of the month, in order that the gates at CleElum Reservoir might be opened and closed as needed to facilitate repairs on CleElum Dam.—*J. L. Lytel.*

RIVERTON PROJECT, WYOMING.

The temperature during November was several degrees lower than normal, although there was no very severe weather. The precipitation was 0.09 inch falling as snow. A high wind early in the month combined with a light snow rendered the roads impassable for several days. Since then they gradually improved and during the last half of the month were in good condition for freighting.

Both draglines were operated two shifts throughout the month on the Wyoming Canal. The total amount of excavation moved was 29,955 cubic yards, of which 450 cubic yards were excavated from outside the canal prism. Of the total excavation, 22,795 cubic yards were class 1 material, being heavy gravel; 750 cubic yards were class 2, being hard shale; and 6,410 cubic yards were class 3, being sandstone requiring blasting. There was some difficulty in doing uniform blasting. Several humps were left which were not sufficiently shaken up to permit their being removed. Dragline No. 22 was working on the second cut excavating to canal grade and was moving gravel, with the exception of about 3 feet of shale at grade. Beginning about November 16, this machine was using the 1½-yard class H bucket. Dragline No. 23 was moving sandstone a large part of the month.—*H. D. Comstock.*

SHOSHONE PROJECT, WYOMING.

November was an unusually pleasant month, mild temperatures and fair weather prevailing. It was suited to all manner of outside work except plowing and light concrete work.

Water supply.—The lowering of Shoshone Reservoir by means of the balanced valve control began on the 17th. Water was shut out from the 23d to the 28th because of private appropriators' work in the river bed, but full discharge was again resumed on the latter date.

Operation and maintenance.—Heavy maintenance work ceased on the 1st of the month, but a small crew was engaged each on the Frannie and Garland Division on miscellaneous structure repairs and re-

placements and a small amount of ditch cleaning when wet ground would not previously permit it. In the office the water delivery records were completed and the gathering of crop statistics undertaken and well advanced.

Crops.—Crops were harvested and being marketed to some extent, although many who are able were holding their produce for higher prices. Eighty-seven cars of alfalfa hay and meal and nine cars of wheat were shipped from the project during the month besides 120 cars of beets and 33 cars of potatoes, the marketing of which was necessary because of the perishable nature of the product. Crop statistics indicate that on the Garland Division crops are average except for beets and alfalfa which are below normal; on the Frannie Division all crops are light.

Labor.—The labor situation has been satisfactory the entire month.

Drainage.—On the Garland Division three drag lines and the Austin trencher continued drainage excavation all month. Near the close of the month work was slowed down by frost and the winter shut-down is imminent. The Bucyrus drag line excavated 2,710 linear feet of lower drain 28; the Monighan drag line excavated 1,269 linear feet of Frannie Canal toe drains; the Lidgerwood drag line excavated 2,135 linear feet of open drain X-92, and the Austin trencher 4,650 linear feet of closed drains in the area tributary to the Dry Lake area. On the Frannie Division the Bucyrus drag line continued the excavation of open drain 102 west of Deaver town site, excavating 1,542 linear feet.

Field and office engineering.—Field work was carried on by two crews each on the Garland and Frannie Divisions. Two crews were engaged on work connected with construction and drainage work in progress. One crew on the Frannie Division was engaged on topographic surveys in connection with Sage Creek channel improvement, a wasteway at the end of Frannie Canal, and ninth unit land classification. One crew on the Garland Division was engaged on topographic surveys for drainage and the Willwood Division dam site and the upper reach of the Willwood Canal. In the office the principal work was the preparation of a set of maps in connection with the project's water rights.

Construction.—On the Frannie Division Government forces worked on main canal concrete structures until the 8th, when such work was closed down for the year because of climatic conditions. Two crews were then put on timber structure construction on the third unit lateral system and continued on that work through the remainder of the month. The operation and maintenance crews did some work on Frannie Canal puddling, private land extensions, and a minor waste-water recapturing system. Two of the contractors on the third unit laterals completed their work during the month. Proposals for a small amount of earthwork of the same nature were opened on November 15. Three bids were received. The successful bidders began work on the 26th. These various contractors moved 12,000 cubic yards during the month. At Shoshone Dam a crew was assembled for work on the hydro-electric development. Some camp buildings were erected and plant sites prepared for the installation of construction equipment.—*J. S. Longwell.*

INDIAN PROJECTS, MONTANA.

BLACKFEET PROJECT.

During November clear and mild weather was the rule rather than the exception. There was only one

extremely cold snap, and there was scarcely any precipitation.

The field work carried on consisted of placing a few minor structures on the Badger-Fisher lateral system, maintenance work, consisting of repairs to structures and laterals, assembling and repairing equipment, and similar work.

At the end of the month the field crew was reduced to three. Work in the office was confined to working up operation and maintenance records, estimates for next year's requirements, and routine work.—*R. M. Snell.*

Summary of employees for November, 1920.

Projects.	Begin- ning of month.	End of month.	Increase.	Decrease.
Yuma.....	135	149	14	
Orland.....	74	87	13	
Grand Valley.....	79	138	59	
Uncompahgre.....	65	155	90	
Boise.....	210	739	529	
Minidoka.....	115	125	10	
Huntley.....	50	59	9	
King Hill.....	281	317	36	
Milk River.....	81	93	12	
St. Mary storage unit.....	37	31		6
Sun River.....	57	64	7	
Lower Yellowstone.....	42	28		14
North Platte.....	427	482	55	
Newlands.....	72	72		
Carlsbad.....	15	14		1
Rio Grande.....	480	648	168	
North Dakota pumping.....	38	33		5
Umatilla.....	75	35		40
Klamath.....	81	36		45
Strawberry Valley.....	44	72	28	
Belle Fourche.....	219	45		174
Okanogan.....	93	102	9	
Yakima.....	208	181		27
Riverton.....	35	39	4	
Shoshone.....	241	251	10	
Denver office.....	86	90	4	
Blackfoot (Indian).....	14	3		11
Flathead (Indian).....	192	170		22
Fort Peck (Indian).....	19	10		9
Field legal offices.....	24	23		1
Washington office.....	92	93	1	
Unassigned per diem.....	34	34		
Examiner's force.....	1	1		

Total employees: Beginning of month, 3,716; end of month, 4,419; increase, 1,053; decrease, 355; net increase, 703.

FLATHEAD PROJECT.

At Dry Fork Dam excavation, including stripping, during November amounted to 526 cubic yards, and earth fill to 13,560 cubic yards; 654 cubic yards of gravel blanket were placed. At the outlet works 156 square yards of riprap were grouted. Spillway excavation amounted to 1,413 cubic yards, and there were placed 19 cubic yards of concrete, 8 cubic yards of riprap, and 52 cubic yards of gravel. The outlet works and spillway are complete with the exception of the service gate and footbridge.

At Pablo Feeder Canal enlargement between stations 1254+00 and 1220+00 was commenced and the steam shovel progressed from the former station to 1225+00, a distance of 2,900 feet, involving 11,614 cubic yards of excavation, of which 6,114 was class 1, 5,000 class 2, and 500 class 3. At Dry Creek headworks 541 cubic yards of material were excavated and 21.4 cubic yards of concrete placed.

Preliminary work was begun at Dry Creek in preparation for lining the channel, and at the end of

the month 2,100 linear feet of right of way had been cleared and 625 linear feet of the channel (or 355 cubic yards) excavated to rough lines.

Thrashing was completed during the early part of the month and plowing and seeding were in progress. Unfortunately the price of wheat commenced to decline some time before the local supply was ready for the market. An unusually mild fall has postponed the abandonment of pasture lands and lessened the demand for hay, thereby lowering the price of the latter.

Live stock is in excellent condition throughout the project.—*E. A. Moritz.*

FORT PECK PROJECT.

November weather was about normal, and except for seven days from the 9th to 15th was favorable for construction work.

On account of freezing weather and deep frost, the construction of minor structures was discontinued on the Big Muddy unit on November 18. The equipment has been put in storage and the Government stock has been taken to winter quarters on Poplar River.

The tile drain below the Big Porcupine Storage Dam was repaired and extended about 100 feet. The ditch riders on Little Porcupine and Big Porcupine units were employed burning weeds and cleaning canals and laterals.

The weather was particularly favorable for stock and little feeding was necessary.—*R. M. Conner.*

GENERAL OFFICES.

Washington office.—Director Davis was away from the office during practically the entire month of November. On November 4 he left for New York for a conference with E. F. Drake, director of the Canadian Reclamation Service, in connection with the distribution of the water of St. Mary and Milk Rivers, returning on November 11, and leaving the same day for the West. The major portion of his time was spent on work in connection with the preparation of the report under the Kinkaid Act of the Lower Colorado River development and the possibilities of irrigation in the Imperial Valley, California, which involved, among other things, a trip by boat from the Boulder Canyon dam site down the Colorado River through Boulder and Black Canyons, following in part the route taken by Maj. Powell in his historic trip through the Grand Canyon. Director Davis also acted in a consulting capacity for the city of Los Angeles in connection with the proposed construction of the Pacoima Dam.

During the absence of the director the office was in charge of Assistant Director Morris Bien as acting director.

The chief counsel was in the office during the entire month.

The chief accountant was in the field during the entire month visiting the Denver office and King Hill, Minidoka, Strawberry Valley, Newlands, Yuma, Salt River, Rio Grande, and Carlsbad projects. He returned on December 13.

During the month considerable time was spent in searching the Land Office records in connection with the possible accretions to the reclamation fund on account of the oil-leasing bill. It was difficult to obtain a complete analysis of the situation, but from the best information obtainable the impounded moneys will add to the fund at least \$4,000,000. It is probable a considerable portion of this will be available in the course of a few months.

The balance in the reclamation fund as of November 30, 1920, was as follows:

With Treasury	\$473,690.06
With special fiscal agents.....	797,556.36

The accompanying statement of the finances as of December 10 shows that the actual balance in the Treasury on that date was \$259,500. The indications are that during December there will be some difficulty in supplying the fiscal agents with their needs, but by January the collections on account of construction payments will reach the Treasury and relieve the situation.

H. N. Bickel, former chief clerk on the Flathead project, who has been designated examiner of accounts to take the place of C. E. Piatt, plans to come to the Washington office for a brief stay before taking up his duties.

Fund transactions, United States Reclamation Service.

[Taken from Washington office books Nov. 30, 1920.]

Treasury balance from October report...	\$860,067.67
From:	
Land Office (September).....	109,977.96
Deposits by fiscal agents.....	180,220.49
Collected by auditor.....	7,829.47
Increase compensation advanced...	64,300.00
Total credits.....	1,222,395.59
Withdrawals:	
Requisitions for advances, reclamation fund	627,700.00
Requisitions for advances, increased compensation.....	64,300.00
Auditor's settlements	56,637.31
Total withdrawals.....	748,637.31
Balance.....	473,758.28
Land sales for October, available in December	249,340.52
Estimated land sales for November	140,000.00
Balance with fiscal agents.....	797,556.36
	1,660,655.16
Balance of cash with Treasury Dec. 10, 1920	259,500.00

Printed copies of the nineteenth annual report of the Service were received on November 24, but were not released for general distribution until the afternoon papers of December 8.

During the month 1,283 inquiries from ex-service men concerning opportunities on the land were received and answered. Up to the end of the month a total of 177,704 such inquiries had been received.

Among the visitors during the month were Herman Jansson, C. E., of the Swedish Royal Engineers and the Royal Board of Water Falls, Stockholm, who was enthusiastic in his remarks concerning a trip to the Arrowrock dam; C. P. Hsueh, a Chinese engineer, interested in the Laguna dam and desilting works; Roy O. Hadley, secretary of the Seattle Chamber of Commerce and Commercial Club; Col. B. F. Fly, of Yuma, Ariz.; Mr. Savage, Land Commissioner of the State of Washington; and H. D. Newell, project manager of the Klamath project.

Denver office.—The chief engineer returned from Washington, D. C., on November 7, and on the 16th

left for Yuma, Ariz., to meet the Director in connection with the Imperial Valley report. Assistant Chief Engineer R. F. Walter returned to Denver on the 19th, having visited the Klamath, Okanogan, Umatilla, Boise, and Strawberry Valley projects during November. Assistant Chief Engineer Chas. P. Williams was in Denver the entire month. Official visitors included Messrs. W. A. Beardslee, Andrew Weiss, A. H. Gullickson, L. V. Branch, and H. D. Newell. Other visitors were Messrs. R. B. Walton, of Winslow, Ariz.; Frank C. Emerson, State engineer of Wyoming; Anson H. Smith, of Kingman, Ariz.; Nicamor Cortes, a Filipino engineer; E. C. Finney, of the secretary's office; and A. L. Wishard, secretary of the Klamath Irrigation District.

In the designing division, preparation of designs and estimates for reservoirs of varying capacities at the Boulder Canyon, Black Canyon, Flaming Gorge, Juniper Ouray, Dewey, and Bluff reservoir sites on the Colorado River and its tributaries was completed. The preparation of the report and estimate for the relocation of the railroad around the San Carlos reservoir site, San Carlos project, and other related features was continued. The preliminary designs and estimates for the Connolly Dam, Chain Lakes Reservoir, Milk River project, were completed and specifications for the enlargement of the Nelson Reservoir were prepared and forwarded to the project office. The preliminary designs and estimates for the Beaver Creek Reservoir, Sun River project, were completed, and the designs for the first 12 miles of the main canal, Moxee unit, Yakima project, were reviewed. Numerous designs were prepared for various projects covering lateral siphons, drops, division boxes, bridges, headworks, and siphon spillways. Work was also continued on the standardization drawings of timber highway bridges, turnout gates, radial canal gates, and cast-iron gates.

The electrical engineer attended the conference of the Idaho Power Co. at New York City relative to the acquisition of the American Falls power property and, later on in the month, testified at the hearing in the Truckee-River adjudication suit, Newlands project. The principal work accomplished in the electrical department consisted of studies relative to a change in location of the needle valves at the Pathfinder Dam, studies for the repairs to the balanced needle valves at the Elephant Butte Dam, continuation of work on the designs for the power plant and hydraulic and electrical apparatus at the Shoshone Dam, designs for the substructure of the B Lift pumping plant, Yuma Auxiliary project, studies relative to the development of hydraulic power at the McLaughlin Canyon, Okanogan project, and preliminary designs and estimates for a 270,000-kilowatt power development in Boulder Canyon, Ariz.

In the legal department, consideration was given to drafts of contracts with the Hermiston Irrigation District on the Umatilla project and the Fort Shaw Irrigation District on the Sun River project. Contracts for the investigation of flood control in the Lower Rio Grande Valley, Tex., and for further investigations in cooperation with the State of Arizona were examined and transmitted to Washington for execution.

An average of 465 pieces of mail per day were received during the month; 1,462 disbursement vouchers were paid, amounting to \$366,220; 338 advertisements were issued by the purchasing department; and 599 vouchers were prepared, involving a net expenditure of \$173,344.15. Transfers amounting to \$5,502.80 were effected between the various projects.—R. F. Walter.

¹ Three monthly installments of \$100,000 each have been paid in the \$1,000,000 due in the fiscal year 1921 of the \$20,000,000 bond loan.

ADMINISTRATIVE ORGANIZATION.

DEPARTMENT OF THE INTERIOR.

HON. JOHN BARTON PAYNE, Secretary of the Interior.
ALEXANDER T. VOGELSANG, First Assistant Secretary.
SELDEN G. HOPKINS, Assistant Secretary.
CHARLES D. MAHAFFIE, Solicitor for the Interior Department.
JOHN HARVEY, Assistant to the Secretary.
E. J. AYERS, Chief Clerk and Superintendent of Buildings.

U. S. RECLAMATION SERVICE.

WASHINGTON OFFICE.

Arthur Powell Davis, director; Morris Bien, assistant director; Ottamar Hamel, chief counsel; J. B. Beadle, director's assistant; C. J. Blanchard, statistician; Hugh A. Brown, editor; C. A. Bissell, engineer; A. H. Gullikson, chief accountant; Miss H. A. Fellows and Raymond Depue, fiscal agents; C. H. Fitch, chief clerk; Emmet Carr, purchasing agent; G. W. Numbers, appointment clerk; F. G. Hough, Yakima, Wash., and H. N. Bickel, Denver, Colo., examiners of accounts.

DENVER OFFICE.

F. E. Weymouth, chief engineer, Tramway Building, Denver, Colo.; R. F. Walter and C. P. Williams, assistant chief engineers; Miss L. H. Meisel, secretary to the chief engineer; J. M. Gaylord, electrical engineer; J. L. Savage, designing engineer; James Munn, consulting engineer; J. L. Burkholder, drainage engineer; L. J. Foster, office engineer; J. M. Luney, chief clerk; A. McD. Brooks, purchasing agent; Harry Caden, special fiscal agent.

FIELD LEGAL OFFICES.

Boise, Idaho.—B. E. Stoutemyer, district counsel. Projects: Boise, Minidoka, King Hill, and Jackson Lake Enlargement; R. M. Patrick, district counsel located at Burley, Idaho.

Denver, Colo.—Law section office of chief engineer: E. E. Roddis and Armand Offutt, district counsel; J. J. Buck, assistant district counsel.

El Paso, Tex.—P. W. Dent, district counsel. Projects: Rio Grande, Carlsbad, and Hondo.

Helena, Mont.—W. J. Egleston, district counsel, Helena, Mont. Projects: Blackfeet, Flathead, Fort Peck, Huntley, Milk River, St. Mary Storage, Sun River, North Dakota Pumping, Lower Yellowstone, and Shoshone.

Mitchell, Nebr.—J. N. Beardslee, district counsel. Projects: North Platte and Belle Fourche.

Montrose, Colo.—J. R. Alexander, district counsel. Projects: Grand Valley, Uncompahgre Valley, and Strawberry Valley.

Portland, Oreg.—H. L. Holgate and D. G. Tyree, district counsel. Projects: Yakima, Okanogan, Umatilla, and Klamath.

San Francisco, Calif.—Henry A. Cox and A. B. Fullerton, district counsel, 349 Pacific Building. Projects: Salt River, Yuma, Orland, and Newlands.

PROJECT ORGANIZATION.

Belle Fourche Project.—B. E. Hayden, project manager, Newell, S. Dak.; R. C. Waiber, chief clerk; August Lewin, fiscal agent.

Boise Project.—J. B. Bond, project manager, Boise, Idaho; E. R. Mills, chief clerk; C. F. Weinkauff, fiscal agent.

Carlsbad Project.—L. E. Foster, project manager, Carlsbad, N. Mex.; V. L. Minter, chief clerk and fiscal agent.

Grand Valley Project.—S. O. Harper, project manager, Grand Junction, Colo.; A. W. Walker, engineer; G. H. Murphy, chief clerk; A. H. Hall, fiscal agent.

Huntley Project.—W. M. Green, project manager, Ballantyne, Mont.; G. H. Bolt, chief clerk; Miss L. C. Drinkwater, fiscal agent.

King Hill Project.—Walter Ward, project manager, King Hill, Idaho; T. W. Hause, chief clerk; L. D. Eakin, fiscal agent.

Klamath Project.—H. D. Newell, project manager, Klamath Falls, Oreg.; W. A. Meyer, chief clerk; G. R. Barnhart, fiscal agent.

Lower Yellowstone Project.—L. H. Mitchell, project manager, Savage, Mont.; C. A. Denman, chief clerk; Miss Ruth Lundin, fiscal agent.

Milk River Project.—G. E. Stratton, project manager, Malta, Mont.; E. E. Chabot, chief clerk; J. T. M. Culbertson, fiscal agent.

Minidoka Project.—Barry Dibble, project manager, Burley, Idaho; F. A. Banks, engineer; E. C. Diehl, chief clerk; Miss A. J. Larson, fiscal agent.

Newlands Project.—J. F. Richardson, project manager, Fallon, Nev.; G. B. Snow, chief clerk and fiscal agent.

North Dakota Pumping Project.—W. S. Arthur, project manager and chief clerk, Williston, N. Dak.; H. C. Melaas, fiscal agent.

North Platte Project.—Andrew Weiss, project manager, Mitchell, Nebr.; H. W. Bashore, engineer, Fort Laramie Unit; Paul Roth, irrigation manager; J. R. Ummel, chief clerk; Miss A. L. Perrine, fiscal agent.

Okanogan Project.—Calvin Casteel, project manager, Okanogan, Wash.; W. F. Kubach, chief clerk and fiscal agent; L. V. Branch, engineer, Conconully, Wash.

Orland Project.—A. N. Burch, project manager, Orland, Calif.; E. T. Eriksen, engineer; C. H. Lillingston, chief clerk and fiscal agent.

Rio Grande Project.—L. M. Lawson, project manager, El Paso, Tex.; C. A. Peavey, chief clerk; L. S. Kennicott, fiscal agent.

Riverton Project.—H. D. Comstock, project manager, Riverton, Wyo.; G. H. Baird, chief clerk; J. C. Thrallkill, fiscal agent.

St. Mary Storage Unit.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk; H. E. Bruce, fiscal agent.

Salt River Project.—Being operated by the Salt River Valley Water Users' Association; C. C. Cragin, general superintendent and chief engineer, Phoenix, Ariz.

Shoshone Project.—J. S. Longwell, project manager, Powell, Wyo.; C. M. Jump, superintendent of irrigation; W. F. Sha, chief clerk; L. H. Kline, fiscal agent.

Strawberry Valley Project.—W. L. Whittemore, acting project manager, Provo, Utah; J. E. Overlade, chief clerk and fiscal agent.

Sun River Project.—G. O. Sanford, project manager, Great Falls, Mont.; H. W. Johnson, chief clerk; Miss M. G. Valentine, fiscal agent; G. A. Benjamin, irrigation manager, Fairfield, Mont.

Umatilla Project.—H. M. Schilling, project manager, Hermiston, Oreg.; M. D. Scroggs, superintendent of irrigation; G. C. Patterson, chief clerk and fiscal agent.

Uncompahgre Project.—P. J. Preston, project manager, Montrose, Colo.; A. H. Peach, chief clerk and fiscal agent.

Yakima Project.—J. L. Lytel, project manager, Yakima, Wash.; C. E. Crowover, engineer; R. K. Cunningham, chief clerk; J. C. Gawler, fiscal agent; J. G. Heinz, engineer, Sunnyside, Wash.; J. S. Moore, superintendent of irrigation, Naches, Wash.

Yuma Project.—W. W. Schlecht, project manager, Yuma, Ariz.; R. M. Priest, superintendent of construction; E. R. Schepplmann, chief clerk; E. M. Philebaum, fiscal agent.

INDIAN PROJECTS.

Blackfeet Project.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk and fiscal agent.

Flathead Project.—E. A. Moritz, project manager, St. Ignatius, Mont.; C. J. Moody, engineer; J. M. Swan, acting chief clerk; J. P. Siebeneicher, fiscal agent.

Fort Peck Project.—R. M. Conner, project manager, Poplar, Mont.; Henry Berryhill, chief clerk and fiscal agent.

FEDERAL BUILDING
GRAND JUNCTION
COLORADO

PROJECT OFFICE EMPLOYEES
GRAND VALLEY
PROJECT

Left to right:

John C. Page, office engineer.
C. S. Hoag, draftsman.
Emma A. Gibbs, clerk.
A. H. Hall, bookkeeper.
S. O. Harper, project mgr.
E. R. Romberg, asst. engr.
Oma G. Dixon, stenographer.
A. W. Walker, drainage engr.
G. H. Murphy, chief clerk.



The Reclamation Record

ISSUED MONTHLY BY THE RECLAMATION SERVICE
DEPARTMENT OF THE INTERIOR, WASHINGTON, D. C.

Better Farming : Better Business : Better Living

THERE CAN BE NO SURER INSURANCE FOR THE NATION THAN TO PUT ITS MEN UPON THE SOIL

VOLUME 12, No. 2

PRICE { FREE TO OUR WATER USERS
(SEVENTY-FIVE CENTS A YEAR TO OTHERS

FEBRUARY, 1921



Sunflowers are grown for silage on a number of our projects.



CARLSBAD PROJECT OFFICE AND EMPLOYEES.

Left to right: Joseph R. Yates, assistant engineer; Mrs. Sadie Cheatham, clerk; Victor L. Minter, chief clerk and fiscal agent; L. E. Foster, project manager.

ALFALFA AND LIVE STOCK ON THE SOUTHWESTERN PROJECTS.

EDITOR, RECLAMATION RECORD:

THE COTTON CROP in the irrigated Southwest in 1920 has been very disappointing. Because of the high prices obtained for the crop of 1919 the acreage was materially increased in 1920. Land rental, labor, and machinery were very high priced and the production cost of the 1920 crop was very high. While the yield was fair the market at the close of the season was demoralized and the cotton growers face a serious situation.

In the Salt River and Yuma Valleys particularly, cotton occupied so large a proportion of the acreage that there was scarcely enough land left in alfalfa and grain to produce the quantity of these crops needed for local use. Consequently, the prices for these crops have continued high in those valleys, though on some of the northern projects the market for alfalfa and grain is nearly as dull as is the market for cotton in the Southwest. With cotton cheap and slow to move and alfalfa scarce and high priced it is but natural that the farmers of the Salt River and Yuma Valleys should plan to put their cotton lands into alfalfa this coming season.

There can be no question that there was too much cotton and too little alfalfa grown in these valleys last year, but there is now serious danger that in 1921 there may be too little cotton and too much alfalfa. It is not the purpose here to derogate the production of alfalfa. It has been and should continue to be one of the most important crops of the Southwest, but if a large proportion of last year's cotton acreage is put into alfalfa this coming season there will be more hay produced than can be consumed locally.

There should be no misunderstanding about the basic economics of alfalfa production. It is not possible to produce alfalfa profitably on the high-priced lands of the Salt River and Yuma valleys if the hay must be shipped a long distance to market. Ten years ago with cheaper lands, cheaper labor and machinery, and lower freight rates, the production of hay for sale in distant markets was barely profitable. Then as now the real profits of alfalfa production could be realized only when the hay could be converted into meat or milk on the farms or in the neighborhood where it was produced.

No doubt most of the farmers who are now planning to put their cotton lands into alfalfa are expecting to feed the hay or to market it locally. There is a natural feeling that with hay now selling at from \$25 to \$35 per ton it is a good crop to have, but it is certain that any substantial increase in the acreage of alfalfa will be followed by a sharp decline in price for there is not enough live stock in or near these irrigated valleys to use very much more hay than was produced last year.

One acre of good irrigated alfalfa land should produce in a season in the Southwest enough hay to feed a dairy cow a year. And beef cattle can be counted at the same rate. This means that for each acre of alfalfa planted in 1921, provision should be made for breeding or bringing in one dairy cow or two beef cattle if the latter are to be fed for a six-month period. When one realizes that there were in the Salt River valley alone last year about 180,000 acres of cotton and that possibly one-half of that acreage may be put into alfalfa in 1921, it becomes obvious that the live-stock population of the valley must be greatly increased or hay will be very cheap.

Conditions on the southwestern projects are now unquestionably favorable for live-stock production. In addition to the hay supply, which may be expected to be abundant, there is and should continue to be abundant and cheap supply of cottonseed meal. With these conditions it ought to be possible to make either meat or milk very profitably if the live stock can be had and satisfactory marketing arrangements can be made. Both of these matters deserve serious attention. It is a formidable undertaking to locate, purchase, and ship into one of these distant valleys as many as 10,000 head of dairy cattle in a single year, yet it would take that many to utilize the crop from 10,000 acres of alfalfa land and to produce two carloads of butter a week. Such an undertaking would involve the use of at least \$2,000,000 in cash or credit.

The point to be emphasized here is that turning a large acreage from cotton to alfalfa without jumping out of the frying pan into the fire is not so easy as it seems. Many of the men who produced cotton this past season find themselves heavily in debt. Can they hope to pay out in the next season or two if they turn wholly to alfalfa and the price of hay should drop to \$8 per ton in the stack? Would it not be better to put in some cotton another year? One would not be justified in advising the large cotton acreage of 1920, but it would be most certainly unwise to discontinue cotton production altogether.

There is now no sound basis for predicting the future trend of the market price of cotton, but this much is certain: It can be produced in the Southwest much more cheaply than it was produced in 1920. Production costs can be reduced in two ways, cheaper land rentals and labor and increased yields. Land rental and labor, being subject to the law of supply and demand may be expected to be cheaper next year than last. Larger yields of cotton may be expected if the crop is confined to the lands best suited to it and the best methods of culture and irrigation are used.

In the Salt River Valley where the Pima variety of cotton has done well for a number of years and

where there is an ample supply of pure seed for planting, there is nothing to be gained by experimenting with other types of cotton. There is no evidence that any known variety of Upland cotton will give as good returns in that valley as the Pima.

These comments may be summarized by suggesting that the farmers on the southwestern projects get back into the production of alfalfa and live stock only as rapidly as the change can be made economically and efficiently. These two industries are closely as-

sociated and when kept in balance may be depended upon for fairly safe if only moderate profits. With cheaper production costs and larger yields, long staple cotton may be expected, one year with another, to give profitable returns, and its production should be continued on at least one quarter and possibly one third of the acreage of these southwestern projects.

C. S. SCOFIELD,
United States Department of Agriculture.

IRRIGATION DEVELOPMENT.¹

By E. A. Moritz, Project Manager, Flathead (Indian) Project, Mont.

IRRIGATION as applied to agriculture is the artificial application of water to soil to assist in the production of crops. Agriculture by irrigation antedates recorded history. There are evidences of ancient irrigation works of unknown antiquity on all continents of the earth. Evidences of such ancient works exist in Arizona, New Mexico, California, and Colorado. Laws are known to have been made more than 2,000 B. C. to overcome the troubles and controversies in the use and distribution of water that were similar to those encountered to-day.

Modern irrigation in the United States seems to have had its origin in Utah, where the Mormons introduced this art about 1847. The early settlers of California, Arizona, and New Mexico extended the previous practices of the Spaniards and Indians in those States. Following the development in Utah, modern irrigation was taken up in California and Colorado about 20 years later, and soon the practice had extended to all the arid States. As time went on it reached beyond the strictly arid regions to the less arid or semiarid regions, until now it is difficult to draw a line separating irrigated from nonirrigated agriculture.

During the early history of American irrigation, farmers, singly and in groups, naturally confined their efforts to diverting small streams upon adjacent valleys where the slope of the country and the topography was such as to make the work easy and cheap. With the values of western land then existing and almost unlimited land and water resources, no expensive enterprise was practicable or necessary. Such development proceeding for nearly half a century, widely distributed over the arid region, irrigated in the aggregate a large area of land.

As land values increased, and the more easily constructed projects had been developed, more and more difficult and extensive projects were undertaken, some-

times successfully, sometimes not. As the more difficult and extensive projects were attacked, greater skill in the art and more money were needed. Thus came into the field the irrigation engineer and the promoter, and henceforth troubles and grief multiplied rapidly. It is an exactly parallel case to American railroad development, which passed through similar vicissitudes. In both cases, however, the general benefits in the development of the country were great and lasting, and unlimited approbation is due those pioneers who carved the way for future generations.

On the whole, the irrigation engineer needs no defense for early failures. He did the best he could with the funds and time available, and many times had to submerge his better judgment under the mantle of expediency. The promoter also should not be treated too harshly. As in all other lines of activity there are the good and the bad of the species. Had it not been for the promoters, irrigation would not be where it is to-day. Even development by the Federal Government might have been postponed or retarded. The early enterprises left a wealth of knowledge in their wake, mostly negative to be sure, but nevertheless of great value, knowledge that could not have been obtained otherwise; and somebody had to pay for it.

Meanwhile various national laws were passed to encourage the irrigation of arid lands. The desert land act and the Carey Act are conspicuous examples, but all depended upon the investment of private or corporate capital for actual construction. A great deal was accomplished under those acts, and development proceeded much more rapidly than would have been the case without them. Evidence of the rapid growth of irrigation in this country is contained in the fact that of the total estimated area of irrigated land in all countries, 100,000,000 acres, the United States has 15,000,000 acres, mostly the result of only 50 years' development.

The increasing difficulty of carrying out large irrigation enterprises led to the passage in 1902 of the reclamation act, with the avowed object of enlisting

¹Portion of address delivered at the Montana Irrigation and Drainage Institute, Billings, Mont., 1920.

national funds for the development of projects too large or involved for private, corporate, district, or State enterprise.

The reclamation act provided for the segregation in a special fund of the receipts from the sale of public lands in the 16 Western States, and the investment of this fund in irrigation works, to be returned by the beneficiaries in small instalments. The provisions of the act were later extended to include and apply to Texas.

In the history of irrigation during the past 18 years the work of the Reclamation Service looms large. In the first half of that period many large private enterprises were also undertaken, but since 1912 there has been a practical cessation of such work. The signs now, however, point to renewed activities; in fact, a number of old enterprises have been revived and some new ones undertaken in the past two or three years. The projects now undertaken are on a surer footing than those of past years and the mistakes formerly made are not likely to be repeated.

Immediately after the passage of the reclamation act in 1902, a reconnoissance of the 16 Western States affected was initiated for the purpose of locating feasible projects. The investigators were welcomed with open arms and every district had its offering of suitable projects. Each was considered on its merits and impartially, and with the data already available, supplemented by original investigations, decision was reached for or against construction. At that time, and until the passage of the reclamation extension act in 1914, the Secretary of the Interior was the sole arbiter of what should and what should not be undertaken. With the passage of the extension act, Congress drew to itself the decision what projects should be undertaken and the amount to be appropriated therefor.

In the first few years the operations of the Reclamation Service proceeded smoothly. Then came announcement of construction and operation and maintenance charges, whereupon charges of waste and inefficiency began to develop. The personnel of the service was attacked and congressional investigations were made, but through it all the service emerged with its reputation unimpaired.

The real basis for the charges of waste and inefficiency lay not in the operations of the Reclamation Service, but rather in the inability of some farmers on some of the new projects to meet the charges assessed. Settlers could not be chosen for their fitness and financial ability to develop an irrigated farm, and the system of allotting lands was based on chance. There naturally had to be some failures, and the inherent difficulties of making a living and at the same time developing a farm under pioneer conditions caused a number to go under. The situation was greatly eased by the extension act, which extended the time for payment of construction charges from 10 to 20 years.

In the early operations some mistakes were made. It was a new venture and many of the engineers were inexperienced in irrigation work. This was unavoidable in bringing together the large organization needed in the short time available. I venture to say, however, that the same mistake was not made twice. Education was rapid and thorough and to-day the Reclamation Service has among its personnel some of the ablest irrigation engineers in the country. There is ample evidence of this in the fact that the service is looked to for guidance in matters of irrigation from many sources, and implicit confidence is displayed in its advice and recommendations.

In the 18 years of Federal reclamation activities, 25 projects have been constructed in whole or in part under the reclamation act and 3 projects have been partly constructed for the Indian Service. Four of the former and the three latter are in Montana. Scores of other projects have been examined to determine their feasibility with a view to their possible development later as funds become available.

On June 30, 1920, the net cost of construction of the reclamation projects amounted to about \$125,000,000. The value of crops grown in 1919 on these projects amounted to \$89,000,000 or 71 per cent of the cost of irrigation works. The area cropped was 1,113,469 acres and the gross return per acre was \$79.88. The highest average return for any project was \$367.23. The projects already completed or under way will ultimately comprise an area of over 3,300,000 acres. The irrigable area for which works are now complete is 1,636,000 acres. The area cropped aggregates 68 per cent of this. In addition the Service furnished stored water to 1,012,000 acres under the Warren Act, to supplement the partial supply of private systems otherwise dependent on unregulated stream flow. It is roughly estimated that the 880,000 acres cropped yielded products worth \$64,000,000.

In the past few years and especially since the close of the World War, interest in irrigation development has been keen. Secretary Lane's plan for soldier settlement struck a popular chord and many States have passed legislation that provides machinery and funds to carry on irrigation investigations and authorized cooperation with the Federal Government along that line. A number of contracts have been entered into by the State on the one hand and the Reclamation Service on the other providing for surveys and investigations of irrigation possibilities in such States. Numerous contracts have also been made by the Reclamation Service with individual corporations and districts for similar purposes. Usually the contract provides that the work be done by engineers of the service.

Because of the limited funds available for investigation of new projects, it is practically a policy of the service to make these investigations contingent upon payment of at least half the cost by other interested individuals or organizations. Many investigations

have, however, been made by the service on its own account. This has resulted in securing a large fund of valuable information concerning the feasibility of numerous projects, on many of which work should and could be commenced as soon as funds are forthcoming. There is no question that the time is ripe for a rapid advance in agriculture by irrigation. The definite desire of thousands of men and women to embark on irrigation farming should be met by a comprehensive scheme of irrigation development.

The recent dry spell in Montana has added a great stimulus to irrigation here. The question, however, continually recurs whether or not this is permanent interest or if the present enthusiasm will die out when it begins to rain again. It would be unfortunate if this should happen. The advantages of irrigation are apparent from the statistical fact that the annual farm census of the Reclamation Service shows the value of products grown on its irrigation projects to be about twice as large per acre as the average yield of unirrigated land in the humid regions. Compared with so-called dry-farming in the semiarid regions, the balance in favor of irrigated agriculture is very much greater. The chief reasons for this preeminence of irrigated agriculture over nonirrigated agriculture are, in the order of their importance, as follows:

(a) Ability to apply water at the correct time and in correct quantities.

(b) Presence of more mineral plant food in the soil because it has not been leached out by the rainfall as in humid regions.

(c) Greater amount of sunshine during the growing season than in the corresponding latitude of the humid region.

As a rule, greater care is exercised in planting and cultivating the crops that are irrigated and in every way the irrigationist is encouraged to more careful and intensive agriculture because he is in a large measure the architect of his own destiny, being practically independent of rainfall for his moisture and having in practical control the most important factors bearing on his success.

In the light of our social and economic structure there is another important manner in which irrigated agriculture stands preeminent, namely, in the development of cooperation. The farmers of the humid regions are recognized as the most individualistic portion of the American people. Their daily occupation provides fewer points of outside contact than that of any other part of the population. Consequently, the farmer in humid climates has comparatively little opportunity to develop the power to cooperate. This is not true, however, of the irrigation farmer. In the present state of the art it is not possible for him to follow his individual desires solely and at will. He must cooperate with his neighbors and with his neighbors' neighbors, such cooperation being enforced

by the necessity of community use and operation of the irrigation system. Such cooperation tends strongly to develop community conscience and public spirit, and the character of civilization produced by irrigated agriculture therefore has a tendency to create a higher order of citizenship than is the result without it.

Construction operations of the Reclamation Service during the past few years have been limited on account of the scarcity of funds. Much large development work that is ready to be taken up has had to be postponed on that account. Operations have been confined almost entirely to drainage and other work that was imperatively necessary to insure the integrity of past investments or to meet the moral obligations of the Federal Government to the settlers on its several projects.

The reclamation fund will, however, probably be augmented by several millions of dollars proceeds from the act of February 25, 1920, for leasing lands containing coal, oil, and other minerals. For past production 70 per cent of the revenues under this act go to the reclamation fund and for future production, 52½ per cent. No definite statement can be made of the amounts that may eventually be available.

During the past fiscal year, 290 farms of public land were opened to entry under the reclamation act, comprising 21,000 acres. All but 23 of these farms were taken up. On the North Platte project, Nebraska and Wyoming, 20,000 inquiries were received regarding 80 farms, aggregating 5,000 acres opened for entry on that project; 3,298 applications—40 applications per farm—were filed, accompanied by first payments aggregating \$1,200,000. Applications were accepted only from honorably discharged soldiers, to whom the privilege of filing was limited by Public Resolution No. 29. Similar conditions in a lesser degree, obtained at the opening of 57 farms, comprising 5,500 acres on the Shoshone project in Wyoming. From this the conclusion is inevitable, that given the opportunity, there will be a large inflow of ex-service men and other prospective farmers to the irrigated sections.

The people of the country, more and more, look to Federal institutions for aid in their problems and assistance in accomplishing their desired objects. This is a healthy condition and should, if properly held in check, lead to a better public spirit and citizenship. The Government should, however, help only those who are willing to help themselves, and it should be clearly demonstrated that Federal assistance is necessary before such assistance is granted.

We read and need the RECORD.—*Addiel F. Olsen, Fairview, Mont.*

Have enjoyed the reading of your very interesting and valuable publication for some years.—*C. B. Strong, 5649 College Avenue, Oakland, Calif.*



PERSONAL letters and reports from several projects indicate a more cheerful attitude among the farmers than existed two months ago. The drop in prices of nearly all commodities is responsible in part for this change, and the naturally optimistic nature of the irrigation farmer has helped some also. The chaps who were hardest hit, the tenant and the purchaser at boom prices, are not reconciled of course. In the Southwest the cotton growers still have the blues and the outlook is not encouraging for them.

A study of the settlement mail during the last three months shows no falling off in interest in irrigated lands. Our inquiries, as a rule, are from a class of people possessing considerable capital and generally with farm experience. We are endeavoring to direct them to projects which offer best opportunities for purchase of excess lands, but are somewhat handicapped by lack of late information. Definite information on this subject right now would be extremely helpful. The inquiries from ex-service men are still being received indicating that many of the heroes of the late war are not yet happily placed.

NOTED HERE AND THERE.

Arizona, Salt River project.—Those pale, innocuous little plants that lie so quietly on our toast are not to be sneezed at, for they are just as profitable as they are innocent looking. Over in the Salt River Valley last year asparagus brought an average return of \$1,100 an acre, the highest gross return brought by anything grown in the project.

Lettuce did well, averaging \$687 an acre. Alfalfa, of which we hear so much, brought its growers \$72 an acre. Even berries brought an average gross return of \$460 an acre. The total return on the crops of the valley exclusive of cotton was nearly \$6,000,000. That amount was produced on 51,000 acres. About 42,000 acres of cotton were grown.

The man who has been referred to as up Salt River wasn't so badly off after all, maybe. Not if he grew asparagus.

Arizona-California, Yuma project.—The Yuma project received two excellent press notices last month. The Kern County (Calif.) Farmers' Weekly and the Project and the El Paso (Tex.) Herald paid flattering tribute to America's Valley of the Nile. From the latter we quote:

Progress is written all over Yuma.

Yuma, the little city on the banks of the Colorado, once a steamboat landing for vessels that plied between the Gulf of Mexico and this point, one time the dustiest place on the globe when the wind blew, and the butt of all the jokes in the country, has capitalized its climate and cashed in on it.

To-day oranges and dates are grown at Yuma in commercial quantities, alfalfa produces more crops than in any other locality in the world, and sick people who come here to get well are not disappointed.

One time, the whole country laughed at the joke about the Yuma soldier who died and went to the regions of Belzebub and sent back home for his blankets.

To-day people come here because the climate is warm, for it takes a warm, sunshiny, arid climate to raise the best oranges, the finest dates, and the most nutritious alfalfa and to restore health and keep it restored.

Yuma is not as hot as the rest of the world believes, for, like El Paso, there is an absence here of the humidity that makes it so warm in the East, the South, and the Central West.

Yuma is dry, climatically and legally, and its drought was a drawback until the Yuma spirit conquered and the great dam was built north of here to impound the muddy waters of the stream that flows down out of the Grand Canyon and forms the boundary between Arizona and California.

This water now soaks the sandy valley and the climate does the rest. Seeds germinate in a remarkably quick time under the sunshine in this valley and crops grow like the proverbial gourd vine that enabled a certain little boy to climb and climb and climb into the sky and kill a giant.

Yuma has killed the giant of desolation that once surrounded it. In his place it has planted, cultivated, and grown a giant of productivity. And it is only just starting.

They had some trouble with a scale or an insect of some sort in their date orchards and had to destroy a lot of them for a time, but new ones are coming on. Their oranges are just coming into productivity. Their alfalfa fields are just at their best and their cotton is only beginning to show what it can produce in the way of wealth for its growers.

But they haven't planted half the land they can reclaim, yet the city has doubled its business and population in a very few years and is growing right along, regardless of the price of copper and the slump in business in other Arizona towns or the shutdown of factories in the East. Yuma is staking its roll on its agriculture and no community ever made a mistake in this.

California, Orland project.—Orland's Christmas shipments of turkeys totaled nearly 20 tons and sold for 50 cents a pound or better. The aggregate sum

paid into the hands of the local turkey growers was not far from \$20,000. A considerable amount also has been disposed of locally. The turkey industry in this locality is one of the surest, and by many is regarded as one of the best paying industries, investment considered, of any line in which a poultryman may engage.

The Jersey Club has reviewed the dairy prospects of the country and has come to the conclusion that right now is a favorable time for investment in dairy stock. The prospect is good for cheap feed another season. The likelihood is that the difficulties of securing help on the ranches will be much less than they have been during the past two years or more. The price of butterfat and other dairy products, including calves and older stock, is likely to prove as remunerative as other agricultural products, proportionately to investment and labor. Now, when dairying is at a comparatively low ebb, in the opinion of those who have made the matter a study, is the time to invest and secure the profit from the advance in interest in such line of business that is certain to come within a short time.

Idaho, Boise project.—Five hundred and twenty-five carloads of grain, live stock, and potatoes and other farm produce were shipped out of Nampa for the season commencing August 1. The total valuation of the products shipped is estimated at \$482,250.

Idaho, Minidoka project.—J. C. Hadley, residing just west of Rupert, who has gone into poultry raising the past two years under direction of the farm bureau, states he has already attained satisfactory results in raising pure-bred Rhode Island Reds, although starting last year with only four hens and one cockerel.

This fall he received \$40 in prize money won at Cassia, Minidoka, and Twin Falls county fairs, \$13 in excess of the original cost of the breeders.

He has carefully followed the advice given through the extension department relative to proper feeding and housing, with the result that 75 per cent of the hens are laying every day even during the coldest weather.

He is keeping a record asked for by the State department and his name has been placed in the State directory as a producer of pure-bred birds. That this has reacted beneficially on the business is shown by the fact that he has had a number of calls for birds for breeding purposes from different parts of the State.

If you want to know the reason for the cheerful aspect of many of the Minidoka farmers, just remember that approximately 40,000 tons of beets were sliced during the season. The pay roll of the factory at Burley was \$50,000 per month. The factory at Paul closed down about a week earlier than the one at Burley. The two factories paid out to farmers for beets about a million dollars this year.

This, with the pay roll to the employees at the rate of \$50,000 a month for two months, makes a total of \$1,200,000 distributed through the factories during this season.

Not only the beet growers but the entire community here has profited greatly through the sugar industry in this and previous years. The cattle and sheep brought here to consume the pulp from the factory have created a local demand for hundreds of tons of hay and grain and furnished added employment to many of our citizens. In fact our sugar factories are the biggest influence in establishing and stabilizing values, and it is regrettable that present prices of sugar and the future outlook are such that the intended improvements in the Burley factory have been to a great extent abandoned for the present.

Feeding of sheep at the plant of the Burley Feed Manufacturing Co. is developing rapidly. Taylor brothers recently brought in 1,700 head to fatten there, and Lynch & Ferrin are feeding some 4,000 head of sheep in the yards on the specially prepared products of the mill. Our people are just coming to realize the importance of the feed mill to this community.

Montana, Flathead (Indian) project.—R. Tower has received a request for a shipment of seed potatoes to be sent to Yakima Valley in the spring. It is the opinion of many that Flathead-grown seed is just what the growers of that section want. Mr. Tower is also satisfied that the only thing for the farmers in this section to do is to grow more spuds; and, if a market for the seed potatoes can be found as close as the Yakima, it will mean a great deal for Flathead growers.

Latitude, elevation, soil, and climate in the valley apparently are all favorable, but the success of the potato industry depends also upon intelligent practice on the part of the grower. During our recent visit we could not fail to note the lack of cultivation, the unwise planting of too many varieties, and the appearance of disease in many fields. A reputation for good seed can not be earned under such conditions. We suggest to those who contemplate venturing into seed growing as a business that a careful study of the methods of growers in districts which are successful will prove advantageous. Visit the Minidoka and Idaho Falls sections, and also the Carbondale country in Colorado. Don't forget that the production of certified potatoes true to type is a highly specialized industry.

Montana, Milk River project.—The seed growers of the Milk River Valley have completed the organization of the Milk River Valley Seed Growers' Association.

The constitution and by-laws were adopted and directors elected. Twenty-seven members have already

joined the association, and it is hoped that all the seedgrowers in the Milk River Valley as well as any outside of the valley who are growing seed will eventually join the organization, so that the seed raised in the county will all be sold through the seed growers' association.

William De Messemaker, a prominent farmer living northwest of Glasgow, won fourth premium on alfalfa seed at the 1920 International Hay and Grain Show at Chicago. Mr. Messemaker is a grower of choice pedigreed seed. He won first premium on alfalfa seed for two consecutive years at the Montana State Fair and at the valley county fair. His winnings at Chicago were the highest from any Montana section, which makes him the strongest contender for the best alfalfa seed grown in Montana.

Nevada, Newlands project.—It is stated that 210 farmers in the Lahontan Valley signed beet acreage, showing the wide scope of the sugar-beet enterprise for the coming year's campaign.

The office has been fixed up at the factory and the place is ready for the transaction of business.

The work of the Newlands Project Alfalfa Association is already commencing to bring results. J. C. Viera of Los Molinos, Tehama County, Calif., has signed up a feeding contract with Pinger Bros. whereby the former agrees to bring in a herd of 100 dairy cattle to be fed on the Pinger ranch in the Island district. Mr. Viera states that he is very much pleased with the outlook here, and he goes back to California greatly enthused over this project.

The Fallon Greenhead Club, the most active organization of sportsmen in Nevada, has announced through its president, M. B. Johnson, that committees from the club will shortly cause to be planted a considerable area of the lower elevations of the project in wild rice and wild celery, two forms of succulent growth that delight the fowl that form hunting incentive on the part of the entire male population of this community. Several thousand acres will be seeded next month in the Stillwater and Carson Sink districts and additional territory will be thus seeded from year to year. When it is known that the seed to be cast costs in the neighborhood of \$20 per bushel the financial aspects of the enterprise becomes apparent.

New Mexico-Texas, Rio Grande project.—The success of the various cooperative and marketing organizations of the farmers on the Rio Grande project has come to the notice of our farmers on other projects, and we are receiving numerous inquiries which indicate a good deal of interest in this subject. Centered about Las Cruces, N. Mex., is an unusually wide-awake lot of farmers, who under the intelligent and practical leadership of H. H. Brook, have achieved signal success in cooperative marketing of many products.

Dona Ana County is one of the strongest and best organized in the Southwest. It has taken the lead in

all modern cooperative agricultural movements. The history of cooperation in this county is full of throbbing interest and even romance.

The most important enterprise is, of course, the Elephant Butte irrigation district, a quasi-municipal corporation of which every farmer, or rather every piece of irrigated land is a part.

The next in importance is the Dona Ana County Farm Bureau. It is the parent of a host of subsidiary organizations, mostly for the purpose of marketing. In addition to cooperating with the United States Department of Agriculture in the employment of a county agricultural agent and woman's home demonstrator, the Farm Bureau employs a highly paid manager and sales agent.

The most successful and important of the marketing associations is the Rio Grande Valley Dairy Association, which owns a large pasteurizing plant and milk depot in El Paso, selling whole milk, wholesale. The association is paying dividends, has a large financial surplus, and is planning expansion in way of an evaporated milk plant or creamery. Practically all the dairymen of the district are members.

Other marketing associations that are successful are the Mesilla Valley Fruit Association, Mesilla Valley Poultry Association, Sweet Potato Growers' Association, Swine Growers' Association, Mesilla Valley Cotton Exchange, Cabbage Growers' Association, Dona Ana County Fair Association, and the Bee Keepers' Association. Several of these are now being consolidated in a \$100,000 corporation known as the Farm Bureau Marketing Association, which has purchased and is erecting a fruit-packing shed, sweet potato curing and storage house, cotton yards, etc.

Through these organizations the farmer is enabled to make up car lots and ship to all the northern and eastern markets to great advantage and profit. In season solid trains of fruit and vegetables are consigned to eastern markets.

El Paso, a hustling city of 100,000, and growing at the rate of 10 per cent per year, together with Fort Bliss, is on the southern edge of the district and affords a market for an immense quantity of produce.

Oregon-California, Klamath project.—Klamath County pure-bred live stock received its share of attention at the Pacific International Live Stock Exposition. Klamath County people were again assured of the quality of the pure-bred live stock being introduced through the efforts of the live-stock committee of the Klamath County Farm Bureau, when an exhibit from the Klamath County Shorthorn Calf Club took first in both senior and junior classes in the Boys' and Girls' Calf Club contest. The winnings of the calves were as follows:

Senior class: First on Irene Third, owned by Phyllis Lester.

Junior class: First on Mound's Baroness Second, owned by Dale West; second on Mound's Elgitha,

owned by Phyllis Lester; fourth on Mound's Peach, owned by Donald Patterson; sixth on Red Robin, owned by Dorothy Short.

Mound's Baroness Second was declared champion in the division. These winnings mean many things to Klamath Falls. In the first place, it shows that good judgment was used in the selection of the calves. It also shows that good care was given the calves by the club members. It means that Klamath County has her name on the map as a place where good cattle can be found.

Following a lengthy investigation, a report of a committee of the Klamath Chamber of Commerce was recently adopted whereby the chamber backed the organization of a housing corporation to build homes in Klamath Falls to take care of the demand that has been so urgent for the past few months. The splendid work of the committee in charge will be one of the important efforts of the chamber for the present year. The real value of the work will be shown when the organization gets well under way.

The committee has secured James Holland, of Havre, Mont., as their manager, and he is on the ground working up the campaign. It is expected that some houses will be under way shortly, if the weather permits. Klamath Falls will be one of the first towns in Oregon to have a housing corporation fostered by the commercial organization.

Washington, Yakima project.—During the past season the Yakima Valley produced 129,000 sacks of sugar, according to a statement by W. D. Lewis, general superintendent of the Utah-Idaho Sugar Co., in Yakima and with headquarters at Toppenish. The season's run is now over and final payment to the beet growers was made recently.

Yakima's sugar crop, at the ruling price of \$13 a sack, is worth \$1,677,000. The 129,000 sacks are sufficient to provide practically seven sacks of sugar for every person living in the city of Yakima.

H. F. Humphrey, assistant general agent of the Northern Pacific, says that 30 tons of sugar, on the average, can be loaded onto a car. The valley's output of 6,450 tons would require 215 cars for its transportation if it were all rolled out at once.

Yakima Valley beet growers have received close to a half-million dollars for their share in producing this mountain of sugar.—*C. J. B.*

We think it [the RECORD] fine and beneficial.—*H. H. Chetwood, R. F. D. 1, Morrill, Nebr.*

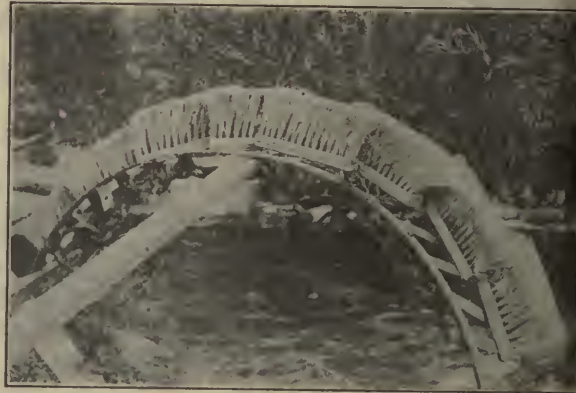
Thanking you for the much useful information contained in the RECLAMATION RECORD, would say I have passed them on.—*Mrs. S. L. Rugg, Sunflower Art Club, Glasgow, Mont.*

SCRUBBER FOR SEMICIRCULAR FLUMES.

D. L. Callicrate, writing in the December issue of the Highway Magazine, describes a novel and effective device to clean semicircular flumes and increase the velocity of flow. We are indebted to Charles B. Schmidt, manager of the Selah-Moxee irrigation district, for the accompanying drawing of the device. Mr. Callicrate's article is as follows:

A number of heavily-bristled scrub brushes attached in a semicircle to the base end of a triangular frame which is supported at the apex by a small wheel has proved an excellent device for scrubbing off moss and silt from the interior of semicircular flumes.

The device, which was designed and perfected by Charles B. Schmidt, manager of the Selah-Moxee irrigation district, in the Yakima Valley, Wash., is illustrated on this page.



Semicircular flume scrubber.

The device is shown upside down at the side of one of the flumes which has been cleaned by it. The scrubber is placed in the flume at the head end, with the brushes resting against the sides of the conduit, and the small wheel, which is at the front end of the frame, on the floor of the flume. The flow of water forces the scrubber along, while the wheel guides it and keeps it from wedging.

As may be noted by close inspection of the device, a heavy iron chain has been attached to add weight and hold the brushes against the sides of the flume.

If conditions warrant, the cleaning operation is repeated a number of times. Where the velocity of flow in the flume is not sufficient to prevent the growth of moss this means of cleaning the conduit has been found very effective.

I am a water user on the Belle Fourche project and have a high regard for the RECLAMATION RECORD.—*Clarence E. Cahoon, Arpan, S. Dak.*



Spraying Saves Alfalfa from Weevil.

THE alfalfa weevil is responsible for the loss of hundreds of thousands of dollars annually to alfalfa growers in Utah, Idaho, Colorado, and Wyoming. But there is a remedy which, when properly applied, will completely destroy the weevil.

The cost of applying the remedy is trifling when compared with the results. It consists in spraying with arsenical solution, the proper application of which is described in Farmers' Bulletin 1185, *Spraying for the Alfalfa Weevil*, published recently by the United States Department of Agriculture.

The spray can be made with arsenate of lead or arsenite of zinc, both of which have been used with complete success. Where arsenate of lead is used the poison is weighed or measured for use at the rate of 2 pounds of powder, or 4 pounds of the commercial paste, to each 100 gallons of water. It is prepared by stirring the poison in a little water until it becomes a thin paste without lumps. It is then diluted and strained and 2 pounds of laundry soap, which assists in making the solution spread more readily and stick to the leaves, is added.

There is practically no danger of burning the foliage of alfalfa. To be most effective, the spray should be mixed just before use and kept stirred up so as to prevent the settling and wasting of the poison and clogging of the pipes in the spray pump. Care should also be taken to keep out all dirt and lint, which might interfere with the free passage of the solution through the spray nozzle.

It is important that the spray be applied at the proper time, which is when the young larvæ of the weevil become so numerous that they completely destroy the growing tips and thus stop the growth of the alfalfa plants. Spraying before this time will fail to catch all of the weevil, and if the application is delayed the pest will destroy so much of the crop that it will be beyond recovery.

In the field infested with the weevil the tops of the plants are as white as if they had been frost bitten. The injury spreads downward, and before the normal cutting time, if the field is allowed to stand, the whole plant is bare of leaves and the green cover

has been stripped from the stems. Before this state is reached, or usually about one or two weeks before the first crop is ready for cutting, is the proper time for spraying. If the larvæ have been poisoned through spraying of the first crop, the second crop sprouts and grows without delay and no further treatment is necessary.

SPRAYING TIME LIMITED.

As the proper time for spraying is limited, it is essential that all preparations, such as securing the spray material and overhauling or repairing the spray machinery, be done in advance. Spray nozzles designed to give a misty spray, sometimes called hollow-cone, eddy-chamber, cyclone, whirlpool, and cover-spray nozzles, are best for this work, since the purpose is to make a fine, even coating of poison upon the upper foliage, where the larvæ usually feed. The character of the spray produced by a nozzle of this type depends principally upon the pressure. With pressures below 75 pounds, many of the spray particles collect into drops and roll off the foliage. As the pressure increases, the spray becomes finer and covers the foliage more completely. As the success of the work depends largely upon covering as nearly as possible all of the sprayed foliage, the pressure should not fall below 75, and might well be kept at 100 or more pounds.

The type and size of spray pump used depends upon the area which is to be covered. Any pump, with brass lining, valves and pistons, capable of delivering four-fifths of a gallon or more per minute, and maintaining a pressure of 75 pounds, can be used for this purpose. The best results have been obtained with nozzle working 2 feet above the alfalfa, each nozzle, as it moves across the field, spraying a strip 2 feet wide. The spray pump should be regulated to deliver 100 gallons of spray mixture per acre. At this rate the actual cost of spraying is about \$1 per acre, of which approximately 60 cents is charged to the poison.

The spraying of alfalfa for the weevil does not injure the crop for feeding, and will not harm farm animals. Many of the cattle which are fed upon it probably take in more arsenic with their drinking water than with their hay, and as for the lead con-

tent, few of them would under any circumstances live long enough to show the least effect of it.

Wrapping Apples in Oiled Paper Cuts Down Scald Loss.

Wrapping apples in oiled paper has been found to prevent apple scald, a cause of heavy loss during storage and transportation. As a result of investigations by the United States Department of Agriculture, a great many of the fancy packed apples are likely to go out next year in oiled instead of plain wrappers.

Scald, department specialists have discovered, is caused by gases given off by the apples themselves. The gases contribute to the flavor of the apple and recently were segregated and identified by department chemists, who even went so far as to build up a synthetic apple odor from chemicals obtained from outside sources. Pending practical use of this discovery, which is attracting scientific attention both here and abroad, the specialists of the Bureau of Plant Industry have applied the distilled chemicals to apples and checked up on their theory as to the cause of scald.

Scald, it has been found, can be entirely prevented by storing apples in oiled (not waxed) wrappers. A good quality of oiled wrapper can be prepared by hand, but the cost of labor is too great. The oiled paper on the market in 1920 had been prepared for other purposes and was too heavy for convenient use, but manufacturers are now preparing lighter weight oiled papers for the 1921 crop.

Ventilation has also been proven to be a remedy for apple scald, but it has been found extremely difficult to secure under commercial cold-storage conditions.

Irrigation of Potatoes.¹

Potatoes constitute a leading cultivated crop in irrigated sections. They make a good cash crop in rotation following legumes, requiring little irrigation and this rather late in the season, while giving a large cash return to the acre-inch of water used. No other vegetable is so widely grown, and so regularly consumed for food. The annual per capita consumption is 3.8 bushels. The potato is sensitive to unsuitable moisture conditions, and irrigation affords a means for control of such conditions.

HANDLING THE CROP UNDER IRRIGATION.

The potato does best where the climate affords a uniformly moist, long, and fairly cool season. The long days of northern latitudes favor such conditions. Potatoes thrive best on soils that are free-working, retentive of moisture, fertile, and well supplied with lime. The nitrogen which is required can be sup-

plied by growing the crop on legume sod land. Phosphorus, nitrogen, and potash must all be readily available. Soils that are compact, water-logged, alkaline, or heavy are not desirable for the crop. Good surface and under drainage is desirable.

A crop rotation is important to provide legume sod land on which to raise potatoes, thereby supplying nitrogen and organic matter in the soil, building up the water-holding capacity, and lessening the amount of irrigation required. Crop rotation also cleans up the land and avoids the insect and plant pests that develop with continuous cropping. The sod land should be disked and then plowed shallow with a sharp plow some months before planting time. A second, deep plowing should be given two or three weeks before planting, allowing time for the soil to settle.

Good solid varieties of potatoes, which are not sensitive to a little overirrigation are desirable, as the Netted Gem or Rural New Yorker. The improved Burbank, however, does very well and may give somewhat larger yields. Hill-selected, treated seed of good-sized seed pieces should be used. Treatment for rhizoctonia is given as follows: Immerse tubers $1\frac{1}{2}$ to 2 hours in a solution of one-fourth pound corrosive sublimate to 30 gallons of water. Dissolve corrosive sublimate in a small quantity of hot water and bring up to the required 30 gallons. Corrosive sublimate is very poisonous and should be kept away from stock. The seed is usually cut into 2-ounce or 3-ounce pieces and dusted with land plaster.

Under irrigation potatoes should be planted at a good depth, say, 5 inches, and in rows preferably $3\frac{1}{2}$ feet apart, with seed pieces 12 inches apart in the row. Seeding can be a little deeper on sandier soils or where there is danger of frost. The seeding should be more or less heavy according to the fertility of the soil. About 14 bushels of seed an acre can be used to good advantage on rich loam soil.

CULTIVATION AND SOIL MOISTURE FOR POTATOES.

Cultivation should begin promptly after planting in order to loosen the soil and encourage deep rooting. The first cultivation should be deep and cultivation should be continued and thorough. By planting with rows far apart and thick in the row, it is possible to cultivate after irrigation so as to mulch down the furrows without injuring the crop roots. Cultivation after each irrigation is important to restore the mulch and the structure of the soil, and to conserve moisture. The "regulation" of the small furrow at head ditches need not be disturbed by cultivation. Less water with more frequent application gives better quality of product. The roots should not be disturbed after the plant begins to bloom.

Potato ground should have a good, uniform supply of moisture at planting time, and should be irrigated before plowing if the winter and spring rains have not

¹ From Oregon Agricultural College Experiment Station Bulletin 173, by W. L. Powers and W. W. Johnston.

provided this. "Irrigating up" is not advisable except possibly in loose sandy soils. Irrigation should be delayed as long as possible after planting without affecting the vigorous, healthy growth of the vines. The aim in irrigating potatoes is to provide a uniform moderate moisture content, so as to keep the crop growing at a uniform rate. Ordinarily the first irrigation is applied at the time the vines begin to bloom. A second irrigation may be applied, if needed, when the blooming is about over. Where the soil is sandy it is liable to dry out in parts; light irrigation may then be necessary when the vines are several inches high, in order to provide a more uniform moisture supply and a more uniform temperature in case there is danger of a late spring frost. The last irrigation should always be 50 days or so before harvest to permit the water in the soil to be used up before marketing the crop and to permit proper maturity. Potatoes are sensitive to excess water. Cold, wet soils favor scab. A moderate slope is better than flat ground, especially on heavy soil. Irregular moisture content is caused by delay or through heavy irrigation, which results in a second growth and ill-shaped potatoes. Good potato soil will store about 50 per cent of the moisture needed by the crop, and examination of the soil for moisture is the safest guide as to when to irrigate potatoes.

IRRIGATION METHODS.

Furrow irrigation is the only practical method for potatoes.

The furrow should be made deep so as to allow the water to be drawn up to the vines by capillarity and also to avoid wetting the surface mulch. The soil should not become saturated and puddled in the tuber bed. The deep furrow provides for loose earth placed around the tubers to protect them and form a mulch after irrigation; it prevents excess of water or light around the tubers and checks loss by evaporation. A smooth furrow, such as made by a sled, or a block following the shovel plow in light, sandy soil, will carry water farther, whereas in heavy soil a loose furrow, such as would be left by a shovel plow or cultivator shovel, encourages percolation or absorption.

The water is led along the head ditch and is turned into the furrows between every two rows through openings cut in the bank with a shovel or through the lath tubes called "spiles." A 1-inch stream may be allowed to run into the furrows until they are wet down to the lower end, after which the stream may be closed down to one-half the former size, or just sufficient to keep free water in the furrow to the lower end and permit soaking throughout its entire length. Water in the furrow should run clear and not puddle the soil.

The time to allow water to soak into the soil will depend upon the soil type. With fine sandy loam,

from one to two hours will be sufficient. A shovel or soil auger may be used to see how far the ground is wet down and out from the furrow. Drainage furrows should be opened across the lower end of the rows so as to equalize the water reaching the lower end and to secure more uniform distribution without puddling or flooding. With careful irrigation there should be little or no drainage and no flooding should occur.

The length of run will depend upon the soil type and the amount of surface slope. Twelve rods is a good length of run in sandy loam soil. In heavier soil the runs may be as much as 440 feet, or one-third the width of a 40-acre tract. The greater the slope, the smaller the stream of water; whereas on flatter ground the larger head will push over the furrow faster and farther.

Live Stock on New Irrigated Farms.

Some of the personal experiences of Prof. T. C. Mead, of the University of Idaho, on irrigated farms lead him to believe that a definite order of procedure should be followed in the adding of live stock to a new irrigated farm.

The first effort should be made to develop the place apart from the live-stock feature. The settler will need a house, domestic water supply, garden, provision for a team, the leveling and preparation for irrigation of a portion of his land; and fences. At this stage he will need a team. If he has feed he can look after a family cow and a few chickens. Even the chickens will need a house and, better still, a chicken run. The danger at this time is that the settler may be led by favorable prices or abundant natural feed to invest in live stock, the care of which will delay and seriously handicap the improvement of the place for irrigation farming.

Only after there are fences, a dependable feed supply, stock water, and stock shelter, corrals, feed racks and feed handling devices, should any extensive purchase of live stock be made. It is better to purchase one kind of live stock at a time, remembering that each new kind added to the farm means additional handling devices, means of feeding, separate pens or corrals, and not infrequently separate pastures. The same effort and capital will go several times farther in caring for one kind of stock than it will for two. Sheep and cows need separate pastures. If in the same enclosure colts and mules will sometimes kill or injure sheep, and hogs will annoy ewes during lambing time, and will get the habit of eating newly born lambs.

In general live stock should be purchased only after it can be properly cared for. This follows necessary development and improvement work. When live stock is purchased it is better to prepare for one kind at a time, adding new kinds only when certain that the

addition is not detrimental to the interest of the stock already possessed.

Corn Aids Dairy Cow Ration.

It is time that correction should be made of the impression found in certain localities that corn is not good feed for dairy cows. Certain recent inquiries on this subject indicate that the use of corn in the dairy ration is not understood by all dairymen; and it is hoped that a correction of this impression may lead to a greater utilization of the large 1920 crop for dairy-cattle feeding.

"When it is fed for a definite purpose, with a complete knowledge of its limitations, as well as its true worth, corn is one of the best and cheapest grains we have that can be used for the economical production of milk," says a feeding specialist of the Dairy Division, United States Department of Agriculture. "Some dairymen avoid feeding it altogether, on account of the mistaken idea that it is not suited to a cow producing milk. This is because it is so generally used for fattening both hogs and cattle, and because it has not been successful when used alone for dairy-cow feeding.

The function of corn in the ration is to furnish the animal with material for producing heat, energy, and fat; but is rather low in protein and deficient in ash. When fed alone, it does not supply largely the nutrients which make bone, muscle, hair, and the casein in milk. Consequently, in compounding the grain ration it is necessary to add to corn some feed which is high in this substance, such as bran, linseed meal, or cottonseed meal. Bran is useful because it not only lightens the ration, but helps to balance it. Corn-and-cob meal is largely used in feeding dairy cows, and it has one advantage over corn meal in that it is more bulky, although not so palatable. Usually, when corn forms a large portion of the grain ration, protein also should be supplied by feeding some leguminous hay, such as alfalfa or clover, for the roughage in the ration.

Since corn can be grown on most dairy farms, supplies energy in a cheap form, and is palatable, and since, when it is made into silage it provides the cheapest and most efficient form of succulence, every dairyman should have the information that will enable him to make corn the basis of a successful ration for economical milk production.

Farmers' Bulletin No. 743, *The Feeding of Dairy Cows*, contains a discussion relative to the digestible nutrients found in corn, and gives samples of grain mixtures of which corn forms a large part.

Remove Hazards from Hatching Eggs.

Hazards which sometimes accompany the incubation of eggs are largely avoidable. Fertile eggs from vigorous breeding stock are necessary in order to obtain good hatches.

Free range for the breeders is most desirable for the production of fertile eggs with vigorous germs, but not all eggs produced from such hens should be used for incubation. Eggs that are abnormally small and poorly shaped or those having thin or very poor shells should be eliminated. Dirty eggs or those badly soiled should not be used. If it is found necessary to set slightly soiled eggs they may be cleaned by rubbing lightly with a damp cloth, care being taken not to rub off any more of the natural bloom than is necessary.

It is never advisable to use for hatching eggs that are more than 2 weeks old. In freezing weather eggs should be collected two or three times a day to prevent their being chilled. Neither a hen nor an incubator will hatch strong chicks from eggs containing weak germs or from those which have not received proper care.

In preparing the nest for the sitting hen, it is well to put from 3 to 4 inches of damp earth or a piece of grass sod in the bottom of the nest before the nesting material is put in to provide moisture. When the hen becomes broody, and before she is transferred to the nest for sitting, she should be dusted with insect powder or sodium fluoride. In doing this hold the hen by the feet with the head down, working the powder well into the feathers. This should be repeated about the eighteenth day of incubation so as to be sure that there are no lice present when the chicks are hatched.

The hen should be moved at night from the regular laying nest into the nest where she is to be set. The latter nest should be in some out-of-the-way place where the hen will not be disturbed. In order to make sure that the hen will continue to stay in the new nest, she should be started with one or two china nest eggs. If, at the end of the second day, when the hen should be permitted to leave her nest for food and water, she returns in a short time, the nest eggs may be replaced with the eggs that are to be incubated.

Throughout the period of incubation the eggs and nests should be kept clean. Sometimes it will be necessary to change the nesting material. Eggs should be tested twice during the incubation period, preferably on the seventh and fourteenth days, and all infertile eggs and those with dead germs should be removed. When the eggs begin to hatch, the hen should be confined and not disturbed until the hatching is complete. If she becomes restless remove the chicks as they are hatched and keep them in a warm place until the hatch is complete, when all should be returned to the mother hen.

Copies of Farmers' Bulletin 1106, prepared especially for beginners and boys' and girls' poultry club members, may be had free by writing the United States Department of Agriculture, Washington, D. C.

Make a Compost Heap.

Garden waste, decayed vegetables, dead vines, weeds, and the organic rubbish that collects about the place during a busy summer may be cleaned up and put to work again through the agency of a compost heap. Start the heap by laying down a bed of stable manure which has not been burned or heated. The size of the plot will vary with the amount of refuse to be used; for ordinary uses, if the bed is made 8 feet long by 6 feet wide and 2 feet deep it will serve the purpose. Over the manure spread a 2-foot layer of refuse and cover with another layer of manure. This last layer need be only a foot in thickness. Repeat the layers until all the waste has been

disposed of and then cover the whole with a layer of earth.

If it is desired to add to the heap from time to time the top layer may be opened and the new material emptied into the hole thus made. This is convenient for the suburban home where there is no animal to consume the kitchen waste. In the spring the heap is well mixed with a fork and the compost is ready to be spread on the garden plot. The heating manure will effectively destroy any weed seed present and will also break down the structure of most of the materials that have been thrown upon the pile. The process may be continued indefinitely by simply adding enough manure to insure heating. Compost is especially valuable for use in hotbeds and cold frames.

SOME DISEASES OF SHEEP.

By the U. S. Department of Agriculture.

WHEN a list of diseases of sheep is read it is hard to tell it from a list of human diseases, so great is the number, and so similar are the ailments. There will be found in both lists tuberculosis, jaundice, goiter, rheumatism, bronchitis, pneumonia, indigestion, paralysis, eczema, and even dandruff and baldness. While it is true that the diseases of sheep are many—probably more than attack any other kind of live stock—there are none which cause such widespread and devastating outbreaks as hog cholera among swine or the tuberculosis of cattle. Occasionally a virulent strain of the bacillus producing lip-and-leg ulcer will spread under favorable conditions, and necessitate the treatment of entire flocks; or scabies may require general dipping of all the animals; or tape and roundworms may get such a start that radical measures are necessary to prevent losses. So great is the number of sheep diseases which attack individual animals in the flock that they cause a great loss, and require that the sheep raisers be on the lookout for them constantly.

Sheep diseases, other than those carried by parasites, may be classed under the following heads: Infectious diseases, general diseases, diseases of the head and air passages, diseases of the digestive system, diseases of the nervous system, diseases of the urinary system, diseases of the reproductive system, and diseases of the skin.

The best way to prevent losses among sheep is to take every precaution to prevent the appearance of disease. Keep the animals in good pastures—temporary pastures to be preferred—provide suitable housing quarters, give clean, healthful food, and guard against the introduction of diseased animals. In case of illness, which is not familiar to the sheep raiser, a competent veterinarian should be consulted at once. Delay is costly.

Anthrax is a rapidly fatal, infectious disease. In sheep it usually takes the acute form, but may be

subacute. The disease is caused by the *Bacillus anthracis*, an organism of microscopic size. It is contracted through feeding, through wounds exposed to infected soil, and through the contamination of wounds by flies which have fed on carcasses of animals which have died of anthrax or on discharges from diseased animals.

The disease usually runs a rapid course, especially in the first animals affected. Apparently healthy animals suddenly develop weakness of the legs and difficult breathing. They fall to the ground, move convulsively, and may die in a few minutes or within an hour. Where death is less sudden, periods of stupor alternate with convulsions, the mucous membranes of the nostrils and mouth become bluish, the temperature is highly elevated, and bloody discharges may issue from the mouth, nostrils, or anus.

Medicinal treatment has no value in anthrax. The exposed members of the flock which do not show abnormal temperatures (above 104° F.) should be immunized by the simultaneous method, which consists in the injection of a spore vaccine and anti-anthrax serum at the same time. Affected flocks should be removed from anthrax-infected ground as soon as possible, even though immunity measures are being instituted, in order to lessen the exposure to gross infection. Care should be taken that public roads or adjacent premises are not exposed to contamination by infected flocks.

On anthrax-infected farms the wisest course is to vaccinate annually, as immunity can not be depended upon to last for a longer period than one year. Flocks outside of anthrax-infected localities should not be injected with living antianthrax products, because of the danger of establishing new anthrax centers. To guard against infection of the soil all carcasses and animal discharges should be destroyed by burning or by burying deep and covering with quicklime.

Blackleg is an infectious disease which is confined to certain areas where the soil is infected with the blackleg organism. A swelling appears under the skin on any part of the body except below the knee or hock joint. It frequently appears either on the hind quarter or shoulder and often on the face, jaws, neck, or breast. Several of these tumors may form simultaneously. They increase rapidly in size and in a few hours may cover a large surface. Pressure on the swelling may produce a crackling sound, due to the presence of gas in the tissue. The wool in some cases is shed over the affected part. Lameness or stiffness is usually evident. If the tumor is lanced, a frothy, dark-red fluid is discharged. Animals may be protected against blackleg by the injection of blackleg vaccine specially prepared for sheep. Medicinal treatment is unsuccessful.

Malignant edema is an acute febrile disease caused by a wound becoming infected. It is manifested by gangrenous swelling at the point of infection. It occurs after castration, shearing, docking, or in connection with injuries. Medicinal treatment is useless. Disinfection of wounds or areas of operation prevent infection. Instruments used in operating should be sterilized before using. Sheep and lambs, after operation, should be placed for a time in lots or barns which have been cleaned and disinfected.

Hemorrhagic septicemia is an infectious, febrile disease. It occurs in both the acute and chronic forms. Lambs are affected mostly by the acute form, grown sheep by the chronic form. Death may ensue several hours after illness is noticed, or within two or three days. The chronic form may continue for several weeks. In the acute form, dullness, weakness, and a general constitutional disturbance are first noticed. The appetite is lost, thirst increased, and the temperature raised. Symptoms of pneumonia are manifested by difficult breathing and coughing. A serious or purulent discharge may pass from the nose and also from the eyes. The chronic form is indicated when animals are less severely attacked or have survived an acute attack and suffer from a chronic affection of the lungs. A panting respiration, frequent cough, and a mucopurulent discharge from the nose and sometimes from the eyes are present. The body becomes thinner. There is stiffness and sometimes swelling of the joints, especially of the knee joints.

There is no successful treatment known. The sick animals should be isolated and the flock moved to new ground. Stables should be cleaned and disinfected frequently. Antihemorrhagic septicemia serum and vaccine are used with considerable success in immunizing exposed sheep.

Tetanus is an acute, infectious disease manifested by persistent, spasmodic contractions of the muscles of the body. Symptoms are acute in sheep and recoveries exceptional. Death usually occurs in two or

three days, but the animal may live a week. Stiffness is first noticed. The nose is held high, the tail elevated, and the back arched. Animals showing symptoms may respond favorably to treatment with large doses of antitetanus serum if injected early in the course of the disease. Because of the expense this would be practicable only in the case of valuable animals.

The disease known as lip-and-leg ulceration is widely distributed in the United States. It is characterized by the formation of ulcers on any part of the exterior of the body, but principally (in the order named) on the lips, nose, chin, cheeks, gums, hard palate, legs and feet, and on the sheaths of bucks and wethers. Losses from lip-and-leg ulceration are at times severe, reaching as high as from 20 to 30 per cent of the flock.

Treatment of this disease by local antiseptics is very satisfactory if begun in time and applied energetically. In mild, unadvanced cases the best results are obtained by removing the scabs and shreds of tissue from the diseased areas with a piece of sharpened wood. Then apply three or four times weekly a 3 per cent solution of one of the cresol or coal-tar dips, or, better, a dressing containing 5 parts of one of these dips, 10 parts of sublimed sulphur, and 100 parts of mutton tallow, vaseline, or lard.

Necrobacillosis of the navel of lambs is rapid in its course. The affected animal shows general symptoms of disease and death follows in from 2 to 10 days after birth. In one case reported in Nevada more than 1,500 lambs died from this trouble out of 5,200 lambs born on the ranch that season. Medicinal treatment is ineffective. The disease is prevented by good sanitary conditions at lambing time. If it has broken out the flock should be moved to new ground or quarters. The navel cord should be disinfected soon after birth with 10 per cent carbolic acid or 5 per cent compound solution of cresol and preferably tied close to the navel.

Joint ill is an acute, infectious disease of newborn lambs which is characterized by swelling of the navel and joints of the lambs. Signs of the disease usually occur within 48 hours after birth. The navel cord swells, contains a purulent secretion, and dries slowly. The animal is dull, lies down a good deal, and loses the desire to suck. There is stiffness and swelling of the hocks, stifle joints, or knees. To prevent the disease, place the pregnant ewes, shortly before lambing, in clean, disinfected quarters containing clean, fresh straw. Wash the navel cord of the newborn lamb with 10 per cent carbolic-acid solution or 5 per cent compound solution of cresol as soon after birth as possible and repeat daily for two or three days. Tying the navel cord close to the navel is advisable.

Rabies is an acute, infectious disease affecting the brain, ending in paralysis and death. It is caused by a living virus which is transmitted to animals and man by the saliva of rabid animals through biting. Dogs are most frequently responsible for the spread

of rabies, but any affected animal that bites another may transmit the disease. Affected sheep can not be cured. Those known to have been bitten by rabid animals may be protected against the disease by the Pasteur vaccine treatment if promptly given. This is expensive, but may be warranted in the case of valuable sheep.

Bighead is characterized by a sudden swelling of the head and ears. The affection is not very widely distributed. It is found in Utah and the surrounding States, the greatest losses occurring in southern and central Utah, southern Idaho, eastern Nevada, and western and southern Wyoming. It is also seen occasionally in sheep brought as feeders from those regions into the Middle Western States. In such cases the disease occurs shortly after the arrival of the animals early in the autumn if heat is excessive.

The first noticeable symptom is that the animal begins to throw its head up and sidewise in a jerking manner. It is greatly irritated and shakes the head and tries to rub it. The animal walks aimlessly through the flock, often stamping its feet on the ground, and seldom standing still very long. If the animal is watched after the jerking of the head begins, one can see the ears turn red and enlarge. At about the same time the cheeks show congested appearance. Ears and cheeks continue to enlarge to enormous proportions, the ears drooping as a result of their weight. After the swellings are about complete, small drops of serum of a light-yellow color begin to exude from them. The entire face becomes so swollen as to close the eyes, and in some cases the internal pressure of the serum forces the eyeballs out of their sockets. Fever is always present and shows itself early, the temperature ranging from 104° to 107° F. Whenever affected sheep have absolute rest and some protection from the direct rays of the sun and their heads are smeared with emollients they recover in a short time, while those that are not treated in this manner, but are driven indefinitely without these precautions, become severely affected, many of them dying as a result.

The malady is prevented by handling sheep properly, not driving them too far or too fast on the trail during the heat, especially before shearing in the spring. Sheepmen should not become excited when bighead develops in their flocks and cause the herders to rush the sheep over the ground, as they do where poisonous plants exist. Keep the animals cool so far as possible, and many great losses can be prevented.

The RECORD is all right.—*Thomas A. Kelly, St. Ignatius, Mont.*

I have been receiving the RECORD and think it is one of the best in its class.—*J. F. Sharples, Zurich, Mont.*

The Reclamation Record.

Issued monthly by the Reclamation Service, Department of the Interior, under the authority of the Secretary of the Interior.

Copies of the RECLAMATION RECORD will be sent free of charge to any water user on our reclamation projects. The subscription price to others is 75 cents a year, payable in advance. Subscriptions may be forwarded to the chief clerk, United States Reclamation Service, Washington, D. C., and remittances (postal money order or New York draft) should be made payable to the special fiscal agent, United States Reclamation Service. Postage stamps will not be accepted.

Material for publication in the RECLAMATION RECORD should be addressed to *Editor*, United States Reclamation Service, Washington, D. C., and should be mailed in time to reach the editor not later than the 14th of the month, in order to insure publication in the succeeding month's issue of the RECORD.

HUGH A. BROWN, EDITOR.

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Reclamation Record.

[To be used only by persons who are NOT water users on the projects of the U. S. Reclamation Service.]

_____, 1921.

CHIEF CLERK,

U. S. Reclamation Service,

Washington, D. C.

DEAR SIR: I am NOT a water user on one of the projects of the U. S. Reclamation Service, but wish to receive the RECLAMATION RECORD each month.

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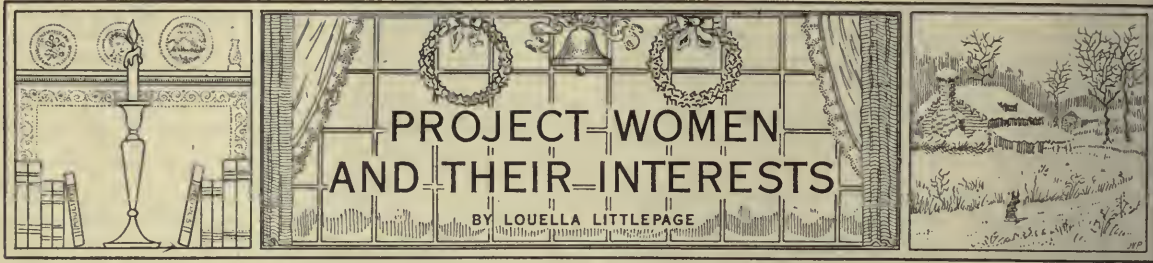
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Be thankful you are paying an income tax to Uncle Sam and not an indemnity to William Hohenzollern.



IN a certain prosperous farming community there stands a great barn. It is shining with paint and safeguarded by numerous lightning rods, and its interior is said to be the latest word in efficiency. But the most remarkable thing about this barn is the tiny, one-story farmhouse which stands near by, but hidden by it from any satisfactory view of the road—utterly eclipsed, from the standpoint of size, location, architectural beauty, of comfort and convenience even, by the great ornate, many-gabled, many-windowed barn.

The contrast between the home of this man's family and the barn which houses his crops and stock is so great that it makes the barn appear ridiculous. To a buyer inspecting his pure-bred stock and who innocently inquired how many children he had, the farmer replied he had only raised one, that he never did have any luck with children.

There is a surprisingly large number of people in the world to whom health and luck are synonyms, and when they find out their mistake, if ever they do, it is usually too late; their bodies are already wrecked and poisoned by bad air, improper food, carelessness in dress, and other causes. The farmer with the big barn studies every phase of his business of stock raising. His animals are housed in roomy, well-ventilated stalls; their rations are well balanced; they are vaccinated against disease, kept clean and dry, and safeguarded in every possible way.

Behold his home! Tiny windows look out from stuffy attic sleeping rooms; drinking water is carried in pails from the barn well, where a great windmill raises water for the stock; and soft water is dipped from a barrel under the eaves which serves as a breeding place for mosquitoes.

All of which leads us to inquire just what is it we are working for. Is it to get money to buy more acres, more fancy stock, to store money away against a rainy day which may never come? Or are we working to make a home where health and culture and happiness reign?

Ice Supply on the Farm.

The cost of "homemade" ice is small, and the work generally comes during a slack season, so there is little reason why every farm home in the natural ice section should not have ice during the summer with which to cool dairy products, and to make such

delicacies as ice cream, iced tea, iced buttermilk, iced fruit drinks, etc.

If taken from lake, stream, or pond, be sure the water is reasonably clear, free from current, and as pure as possible, being absolutely free from contamination from barnyard or refuse heaps, etc.

In the arid regions where there is plenty of freezing weather there is apt to be little or no water in natural bodies to be had. In that case a little artificial pond must be made if possible. Perhaps the farmer has no suitable place for such an artificial pond or has not provided a pond in time. A splendid supply can still be arranged for by utilizing metal cans. The cans can be made in any convenient size by the local tinsmith, and should be of galvanized iron, reinforced at top and bottom with iron strips. The bottom should be a little smaller than the top to make the removal of ice easier.

The cans are placed near the water supply, filled with water, and left exposed to the weather. A shell of ice soon forms around the inner surface, and when this shell of ice is from 1½ to 2 inches in thickness hot water is poured over the outside of the can and the ice removed. Break a hole in the ice shell and pour out most of the water inside. As freezing progresses water should be poured into the shell, a little at a time, until a solid block of ice is produced. By this method only a few cans are required.

Another method employed where no body of water is available to cut ice from is to run water into the ice house and let a layer freeze. This is done by first constructing a dam of snow around the floor of the house 10 or 12 inches from the walls in order to allow sawdust insulation next to the walls. The interior of the house is then flooded with water a few inches deep, which soon freezes. This procedure is repeated until the house is sufficiently filled. This method can be used only in extremely cold weather, and another great disadvantage is that in order to remove ice it must be cut or chopped out with an ax, which results in uneven and irregular pieces and considerable loss of ice.

If ice can be cut from a natural body of water the ordinary storage is a simple matter, provided certain essential features are included.

Storage.—The building should have no floor other than a foot or two of stone—boulders at the bottom,

grading up to small stone or cinders at the top. On top of this should be placed 1 foot of sawdust.

2. The walls may be single boarded, but are best sheeted inside and out, leaving an air space the width of the studding. At least a foot of sawdust should be placed between the ice and the walls.

3. The roof should contain a ventilator and two windows to draw off the heat from over the ice.

4. The opening for filling should either be continuous or consist of a series of doors one above the other. By using a wooden slide or gangway inclined from the ground to the ice level filling is easily accomplished with a horse, a block, and a length of rope with a noose at one end.

5. Keep each tier of blocks level. Try to cut or obtain all blocks as nearly one size as possible. Fill all crevices and cracks with crushed ice or snow. Make the mass as nearly a solid block as possible.

6. Use fresh sawdust as a filler. Planer shavings, while a substitute, are too coarse. Cut straw or hay, chaff, etc., may be used, but are not so good as sawdust. Where such material is used have a space of 2 feet between the walls and ice.

7. Place no sawdust between the tiers of ice, but see that it is well supplied elsewhere. Leave no spaces unfilled. Place 1 foot to 18 inches of sawdust over the top.

8. From the time the ice is covered, and during the summer, inspect the ice house carefully from time to time. Fill all holes caused by settling and wastage and rake over the top of the sawdust to form a mulch of 3 inches or so of dry sawdust. A little care in this regard will save hundreds of pounds of ice.

Utilization.—As to the utilization of ice little need be said. Suffice it to mention that many of the gravest defects in our dairy products to-day it is said would largely disappear with the prompt cooling of the fresh milk. For the proper maintenance of the household economy, ice may seem a luxury at first. Once used, it becomes a necessity. One of the most satisfactory buildings on the farm is the ice house, especially if it has the cooling room in conjunction therewith.

What are They?

It wasn't such an ignorant woman after all who, when asked, "What are vitamins?" replied that she didn't know, her children had never had them. Dictionaries and encyclopedias give us no enlightenment, and the scientists themselves who discovered them can't tell exactly what they are, although they do know considerable about what they do. Experiments at universities and institutions for medical research have revealed much information regarding the functions of vitamins in body maintenance and building, and the parts of the various foods in which they are to be found.

If you have been led to believe that meats are necessary to give children strength, or that cake or leftovers are good enough to "fill the children up on,"

please read what has been proven by careful tests, and particularly with regard to milk.

According to eminent authorities vitamins are compounds absolutely essential in the food in order to maintain the weight of the body and produce growth. The lack of vitamins causes deficiency diseases, so named because they are due to lack of something in the diet. Vitamins have been classified in three different types, depending upon the functions which they have in promoting well being and growth.

The first type is known as water-soluble vitamins, and these are necessary in order to obtain growth from our food. Lack of these causes beri-beri, which manifests itself by diseases of the nervous system and by other symptoms not always understood. These vitamins are found in seeds, in green plants, in certain bulbs and fleshy roots and fruits, and in *milk and eggs*, as well as in certain organs in the animal body. These seeds referred to include beans, nuts, and the various cereal grains. When cereals are very highly milled in order to obtain a very fine white flour, a large part of the vitamins may be removed. Vitamins are also lost when rice is polished in order to remove the outer layers which contain most of the vitamins.

The second type is known as fat-soluble vitamins, and these are found in *butter, eggs, milk*, and in certain animal organs, such as the heart, kidneys, and liver, and to some extent in other fats, as well as in green vegetables. They also exist in smaller quantities in certain seeds. When fat-soluble vitamins are absent from the diet, animals and man are subject to a disease of the eyes, which appears to be related to exophthalmia, and which, if prolonged, may produce blindness.

The third type is known as antiscorbutic vitamins—that is, those which prevent scurvy, which manifests itself by disease of the bones as well as in other ways. These vitamins are found in oranges, grapefruit, lemons, and other citrus fruits, and in green vegetables, such as tomatoes, spinach, and lettuce, and in *eggs and raw milk*. The drying of vegetables frequently destroys the activity of these vitamins. The best source of supply is in the leafy parts of vegetables, and this is one of the reasons why spinach, lettuce, and cabbage are such valuable foods.

You will note that milk and eggs contain all three types of the life-giving vitamins. Milk is an economical food. It requires no time for preparation, and there is no waste in the form of parings, cores, or bones. It is a complete food in early infancy; it helps children to grow, to keep well, and to build strong, vigorous bodies. Grown-ups, too, will find it wholesome and desirable; while in old age, with the need for simple fare, milk can be largely depended upon. A quart a day is not too much for a child.

When war-time conditions started the price of milk and milk products "upgrade," a surprisingly large

number of people cut down the quantity of milk for family consumption, and many of them began using butter substitutes.

There never was such ill-advised "economy." Milk and pure butter would still be economical if they went much higher in price than ever they have.

Are your children up to standard in weight and height? Are they upright in posture, aggressive, placid, and sunny in disposition, or are they easily fatigued, quarrelsome, anemic, and backward in school? Do you have to explain that your children are thin because it runs in the family; that the reason your boy seems quarrelsome is because the other boys pick on him? Did you ever stop to think that maybe the reason your boy or girl is so "good" while the neighbor's child is full of mischief is that your own child is undernourished? Honestly now, do you really know what a child of the age of yours should weigh?

Underweight may be due to a number of reasons—overwork, inheritance, lack of sleep, defect, and disease, but the chief cause is in the diet. If the food supply is insufficient in certain qualities the body itself is burned to provide energy. Unsuitable food and drink, such as tea and coffee instead of milk, are just as disastrous as an insufficient amount of food. No matter how much food your child consumes, if it does not contain sufficient of the building materials for all the living parts of the body, the child is under or mal nourished. The growing body needs minerals—lime to build strong bones and teeth; and iron to make red blood; it needs protein for muscles and to keep the internal organs in good condition; it needs vitamins for growth promotion and regulation.

Milk is the ideal food; milk is fundamental. Milk is nature's food supplied that the wild young may grow and reproduce their kind. Milk is the basic food with which prize-winning animals are produced, and milk contains all the factors necessary in the diet for adequate nourishment. It is the yardstick of nutritive efficiency. In milk is found a sufficient amount of energy or fuel to supply bodily needs.

The pupils of the Yakima schools have as a part of their regular school exercises the drinking of a half-pint of milk at noon. Early in the school year the school board asked dairymen of the city to bid on delivering a stated number of bottles of milk daily to the different public schools. The milk is sold at cost to such pupils as can afford to pay for it, and given free to those who can not.

The Wood Box.

"I want you to see my wood box," exclaimed a little farm woman not long ago to a visitor. She went on to explain her pride in this lowly furnishing by describing how its unusual arrangement saved labor for the busy farm woman. It was an ordinary box for split wood, some 20 inches deep, 24 inches long,

and about 18 inches wide. Its usefulness lay in the fact that it rested upon a sturdy frame made of 2 by 4 scantlings. The frame is exactly like that of a kitchen table, without the top. It raises the bottom of the wood box some 20 inches from the floor, and, oh, the backaches that it saves the cook!

How many times a day, Mrs. Countrywoman, do you stoop down to the box on the floor for fuel to replenish the kitchen fire? Try a high wood box and see what a difference it makes.

Forcing Flower Buds in the House.

Anyone who has access to a forsythia bush can have an abundance of flowers in the house early in the spring, for the blossoms of the forsythia, which is called Golden Bell in some sections, are extremely easy to force. The buds swell very early in the season, as the forsythia is one of the first shrubs to bloom, and the cheerful yellow flowers will open in the house within a few weeks after they have been brought there, if the stems are placed in water and kept in a fairly warm room.

The pussy willow can also be forced very early in the season, all of the willows starting growth at the first sign of warm weather. When forced in the house the ends of the catkins are often found covered with a bright yellow substance after a few days. This is pollen and completely changes the appearance of the pussies.

Crab apple and cherry blossoms and peach blossoms may be enjoyed in the living room long before they open out of doors and while flowers in the house are still a great luxury, especially in country homes which do not have access to greenhouses. Particularly lovely blossoms are obtained by forcing the flowering almond, an old-fashioned shrub common in many gardens.

Other shrubs which may be forced with ease for home decoration are spiraea and lilacs. Attempts to force lilacs by bringing cut branches into the house often fail because the branches are too small. The only way to make sure of good results is to select a large branch and keep the base in a jardiniere or other large vessel, filled with water. When forcing lilacs it is necessary to keep them in a dark place until the buds are almost ready to open. A warm cellar is a good place. If it is a little moist so much the better, and, of course, the water must be renewed frequently. When brought into a sunny room the blossoms quickly open and make a gorgeous display.

Wide mouthed bottles or vases should be used for the cut branches which you want to flower, and if rain water can be had use it. Snow water is just as good, but any drinking water is all right if a lump of charcoal is placed in the bottom of the receptacle.

Some people think it hastens matters to remove a little of the bark at the base, others cut the bark in spiral form where it comes under the water.

Reclamation Record Cook Book.

SPOON BREAD.

(By Miss Glenna F. Sinclair, director's stenographer.)

2 cups cooked hominy grits. 4 eggs.
 1 cup corn meal. 2 tablespoons butter.
 2 cups sweet milk. 3 teaspoons baking powder.

Add butter while hominy is hot, then eggs, corn meal, milk and baking powder. Have a pan well greased; bake in quick oven about an hour.

WAFFLES.

(By J. C. Muiford, drafting division, Washington office.)

Mix dry ingredients—1 pint flour, 1 teaspoon salt, 3 teaspoons baking powder, 2 tablespoons sugar. Stir in $1\frac{1}{2}$ cups milk and 2 tablespoons melted butter to make batter. Drop in hot waffle irons greased with lard or suet. Serve hot with maple sirup.

JIFFY CAKE.

(By C. A. Bissell, engineer, Washington office.)

Use $\frac{1}{2}$ -pint measuring cup. Put in $\frac{1}{2}$ cup melted butter. Into this break 2 eggs; fill cup to top with sweet milk and stir until well mixed. Then pour it into 1 heaping cup of flour, $\frac{3}{4}$ cup of sugar, and 1 teaspoon baking powder which have been sifted together. Beat well and flavor. Bake 18 minutes in hot oven.

CREAM PUFFS.

(By Leon I. Parkinson, former clerk, Washington office.)

1 cup boiling water. 1 cup flour.
 $\frac{1}{2}$ cup butter.

Mix together on stove, stirring constantly till mixture forms a ball. Cool; then stir in 3 eggs. Drop in buttered tins and bake $\frac{1}{2}$ hour in moderate oven. Whipped cream or custard for filling.

ENCHILADAS—MONTADO CON HUEVOS.

(By L. S. Kennicott, special fiscal agent, Rio Grande project.)

2 tablespoons Crisco in frying pan. 6 chile pods with seeds removed, boiled 15 minutes.
 6 tortillas (corn). 1 cup grated cheese.
 3 chopped onions.

Put into the Crisco the chopped onions and add chile sauce and $\frac{1}{2}$ teaspoonful salt. Cook this 15 minutes, then put in one tortilla at a time; let stand one minute, then turn over and add another, and so on until the six are in. Cook a few minutes, then remove one tortilla at a time to a plate, putting layer of grated cheese and chopped onion on each tortilla. On the top put 3 fried eggs and pour chile sauce around the tortillas.

If you can not buy the tortillas ready made, make a cornmeal pancake about 8 inches in diameter.

To make the chile sauce, get either a bottle of chile powder or a few red chile pods and boll down in water to the right consistency.

DATE LOAF.

(By Miss Sadie Cheatham, clerk, Carisbad project.)

2 cups sugar. 1 package dates.
 $\frac{3}{4}$ cup sweet milk. Butter, size of walnut.
 1 cup nuts.

Cook sugar, milk, and butter until it creams, or to the soft ball test; then add dates and cook until thoroughly done, or cooked to a very thick paste. Stir in nuts and beat until stiff. Roll in wet napkin and let cool. When cool cut in slices.

DROP BISCUITS.

(By Mrs. L. P. Littlepage, Settlement Section, Washington Office.)

Slightly heaping cup of flour sifted with 2 heaping teaspoonfuls of baking powder and $\frac{1}{2}$ teaspoon salt. Rub in lump of lard size of large egg, add teaspoonful sugar, and stir in enough milk to make thick batter.

Drop in greased muffin tins and bake.

WALDORF SALAD.

(By Raymond Depue, special fiscal agent, Washington office.)

Mix 1 cup each of small pieces of celery, apple cut in balls, and English walnuts broken in small pieces. Add 1 teaspoon salt, 2 tablespoons orange juice, and the grated rind of 1 orange. Add 1 cup of mayonnaisse dressing. Serve in lettuce nests or in apple cups made by scooping out the pulp. Garnish with mayonnaisse dressing and pieces of apple skin cut in fancy shapes.

In the publication of the January issue of the RECORD the recipe for raisin spice cake by R. F. Walter, assistant chief engineer, Denver office, was hopelessly "pied." It is reproduced this month:

RAISIN SPICE CAKE.

(By R. F. Walter, assistant chief engineer, Denver office.)

1 cup sugar. 2 eggs.
 $\frac{1}{2}$ cup butter or butter substitute. 2 cups flour.
 2 teaspoons cinnamon. 1 teaspoon each cloves, nutmeg, vanilla.
 $1\frac{1}{2}$ cups raisins cooked in $1\frac{1}{2}$ cups water until 1 cup of juice is left, which should be cooled before using, and then add 1 teaspoon soda. 2 teaspoons baking powder.

Cream butter and sugar and add the yolks of the eggs. Mix the dry ingredients together and add alternately the dry ingredients and raisin juice. Lastly add the whites of the eggs after beating. Bake in oiled pan.

Diary of a Western Boy in Europe—Continued.

By William E. Smythe, jr.

IV. CALAIS AND DOVER.

IN the late afternoon the train pulled into the sheds at historic Amiens; the compartment filled up until there was hardly room to breathe, while it was impossible to look out of the window. I stood in the crowded aisle and talked to the man next to me, as the train started once more, amid the shrieks of the numerous tin horns of the guards.

The short individual to whom I addressed myself told me many details of the country through which we were passing. At one place I could see where a railroad had been temporarily laid, and discovered that it had been used to transport ammunition. I asked about a good hotel in Calais, and he said: "Most Americans stop at the Grande, but the Metropole is very comfortable."

When I arrived at Calais it was just getting dark enough for the few street lights to have some effect. I glanced around on leaving the station and saw a large sign bearing the inscription "Hotel Metropole." There I engaged a room and had a good dinner, and afterwards saw a bit of the town before bedtime.

The ancient city of Calais is situated on the English Channel, just opposite Dover. There are many stories and legends in which this old French town plays an important part. One of the best known is that of the "Three Priests of Calais."

Its market place looks, I imagine, about the same as it did in the days of the Hundred Years' War. The old stone museum, with its tower and beacon light, guided fishing schooners and gay barks into the narrow harbor in the days before the erection of the new lighthouse near the Chemin de Fer du Nord Yards; the little shops, where one may purchase for 3 or 4 francs a good luncheon or supper of fried chips, fish, and a glass of wine; the wine and fruit shops, all made of stone, are as old as the city; but now tiny electric cars pick their way across the stone-paved market place, and stores display English-made caps, suits, and shoes.

Diverging from the market place are many narrow, ill-kept streets. If we take one of these streets we quickly come to the locks that hold a part of the waters of the bay, while the rest rushes out on the ebb. Crossing the locks, we come to the beach and the casino. Taking another of these streets we come to the barbed-wire corral where German prisoners were confined during the war; and beyond are the warehouses and docks where the London-Paris passengers made a quick change from the boat to the Continental Express. If we take an eastbound street we pass a couple of well-kept parks and come to the more modern section of town.

While watching a street fair in the eastern part of town I discovered two Americans who were connected with the Grave Registration Bureau, and who seemed very pleased to find a live fellow countryman who had so recently arrived from the States. They took me to a café, treated me to black coffee, and talked about home. Afterwards we went out on the street and viewed a good-sized procession, which consisted of carts and bicycles covered with flowers. It was very attractive and there were crowds to see it.

After dinner that night I went out on a street where there are a great number of cafés and discovered, to my surprise, that at least every other one had a three-piece orchestra playing just outside. Many couples danced on the broad sidewalks and the warm moonlit night was merry, that Sunday in old Calais.

Monday morning I got up early and went to see the British consulate about my passport. The remainder of the day was spent wandering about the city and purchasing souvenirs. At 4.30 I took my bicycle and suit case through the customs; paid my last bit of French money to the porter, and boarded the large, well-equipped English steamer for Dover. At 5 she backed out into the Channel, swung her nose into the stream, and swiftly left the quaint old town to sternalward.

The waters of the Channel were as smooth as glass, and it was not long before the white cliffs of England hove into sight. Before 6 o'clock we were tied up to the quay at Dover, and it was a matter of but a few moments before I was through the customs and asking a small boy for the nearest hotel. He suggested the "Paris" and offered to convey my suit case thither for "tuppence." I accepted his generous offer and soon found myself in the coffeeroom of a small inn. The room to which I was conducted was large and overlooked the harbor, with its many ships, and the famous Dover Castle, which looked like a painting in the misty light of late afternoon.

Returning to the coffeeroom I had supper of fried fish and then went in search of amusement. I took a tram into the center of the city where I discovered a cinema; this I entered and found it the most comfortable I had ever been in. And my knowledge of picture shows is somewhat extensive, too. The seats were long, heavily upholstered lounges; one might lean back to the full extent and still see the screen perfectly. There was an English play called "Hidden Rocks."

Laying the theater I returned to my hotel and bed, to fall immediately into dreamless slumber.

—L. L.

(To be continued.)

ENGINEERING INVESTIGATIONS.

Use of Crayons for Tinting Charts and Diagrams.

By Julian Hinds, Engineer, U. S. Reclamation Service.

THE application of color to progress charts and maps and diagrams for reports is a part of the work of every engineering office. If properly handled, water color is perhaps the best material to be used for this purpose, but colored crayons can be used with greater ease and with very good effect. Few draftsmen are able, without considerable practice, to do water-color work neatly, whereas crayon color may be applied by almost anyone.

To secure the best effect, the crayon should be applied lightly to the paper and spread with gasoline. The gasoline may be applied with strips cut from an ordinary blotter or with a fairly stiff color brush. The blotting paper may be rolled or folded, if desired, to give greater stiffness. Absorbent cotton twisted around a sharpened stick also makes an excellent spreader. For small or narrow areas a soft splinter, or a match stick, sharpened to a blunt point may be used. For large areas an artist's stub will be found convenient. The amount of gasoline used will depend largely upon the kind of paper upon which the color is being spread and upon the skill of the draftsman. Some men prefer to flow the gasoline on rather freely, rubbing the color very lightly; others prefer to use only enough gasoline to moisten the spreader. In the latter case, more rubbing will be required, but a more uniform and even distribution of the pigment will be obtained.

Crayon colors have a distinct advantage in that they can be applied to tracing cloth. For this purpose, a blotting paper or cotton spreader should be used with a minimum amount of gasoline. If the gasoline is flowed on too freely the color may be entirely removed. With a little practice excellent results can be obtained.

In applying the color to the paper, it is important that the crayon be rubbed in lightly. If pressure is used, the pigments are rubbed into the paper and will not spread readily. Deep tones should be obtained by continued light rubbing. The colors are much stronger after spreading and care should be used not to apply too much pigment.

After the application of the gasoline, the color should be dead flat, uniform, and perfectly transparent. Color applied in this way does not readily rub off, but unless the paper is very porous may be removed with a soft rubber eraser.

An inexperienced man will get much more artistic results with gasoline and crayon than with water color, and an experienced man will get good results with a much smaller expenditure of time and patience. For small intermittent jobs, crayons possess the advantage of being always ready and requiring no paraphernalia. Also, shades applied at different times are easily matched. Wax crayons probably give best results, but any kind of colored pencil or "lead" pencil may be used.

REPRODUCTION OF MAPS AND DRAWINGS.

By J. H. Pellen, Chief Draftsman, Washington Office.

THE first maps reproduced for the service were the plane-table sheets of the early topographic surveys, many of which were inked in and titled after they came in from the field. The prints and negatives of these are still in use. The wet plates for this class of work are made in the Geological Survey laboratory and are exposed and developed before drying. The same glass is used continuously, as the negatives are kept only a limited time. After an order is filled a paper negative is made from one of the prints. This negative is filed and used for future orders of blue or black line prints. Land Office plats are also reproduced in the same manner.

Photostat.—The photostat process of making copies from drawings and manuscripts is operated by means of a camera fitted with prism and developing outfit, so that an exposure can be made directly to sensitized paper, which is developed and fixed before leaving the machine. The drawing is reflected in the

prism, whence the lens projects it to the paper, which has been unrolled and exposed the required length, according to an indicator on the side of the machine. The print appears in white lines on a black background—the reflection referred to preventing it from being reversed. The focusing is done by a gage. Under ordinary working arrangements the largest original that can be exposed is 30 by 40 inches, and the largest single print that can be made is 18 by 24 inches. Any class of work that will reduce to white and black can be copied. Pencil notations covering pages of field note books and blue prints have been successfully copied. When a black-line print is desired it is necessary only to recopy one of the original prints. This process is probably the most economical for making copies from drawings made on opaque material, and for miscellaneous work where a negative is not wanted for filing. The process gives quick results in an emergency.

Celluloid negatives.—A very convenient method has been adopted for reproducing specification drawings issued by the Denver office. They are photographed down to regulation size by means of wet plates, glass or celluloid, from which blue-line prints are made for binding in with the specifications. This is a quick and economical process for small editions, and has the advantage of celluloid negatives when desired for filing. It is suitable for any kind of line work, and requires the same general treatment of drawings for first-class work as other photographic processes. It is more difficult, however, to make changes on celluloid than on glass negatives.

Photo metal plate.—The method by which maps, farm-unit plats, town-site plats, standard designs, contract drawings, etc., are reproduced in quantity for the Washington office is a photo metal-plate process variously known as "planography," "zinc-plate process," "zincography," and "photolithography" from which it has evolved. Zinc plates and aluminum plates are used with equal facility. It is not a relief process like that known as the zinc etching or line-engraving process.

An exposure of the drawing is made by means of a prism which reflects the drawing at right angles through the lens on a wet plate which, when developed, shows the drawing reversed as to black and white but reading direct (similar to a photostat print). After the glass plate is developed and dried it is touched up by spotting all imperfect parts with a preparation of lamp black and asphaltum applied with a brush; weak and broken lines are retouched by cutting through the collodion film with a steel needle point fixed in a holder like a pencil.

A print is made through the glass plate to a sensitized zinc or aluminum plate having a grained surface. After this exposure the entire surface of the zinc plate is covered with ink, after which it is washed with water to remove the ink and film from the parts of the surface that have not been exposed and consequently hardened by the action of the strong light. To those parts which represent the delineation the ink adheres and forms a protection against the etching that is now given to the rest of the plate to complete its preparation for the press. When not actually in use the plate is kept covered with a coat of gum arabic.

As in lithography, this process depends on the aversion grease and water have for each other. Therefore all presses are so constructed that the plate comes in contact alternately with damp rollers and ink rollers, the lines of the work accepting the ink and repelling the water, and the balance of the plate remaining damp and repelling the ink. This immunity from ink on the part of the plate where there is no work is due to the etching and grained surface, the etching causing a chemical change in the surface of

the plate which, being rough, holds dampness evenly, while the surface of the lines is smooth and greasy, forming an affinity for the ink only. The foregoing refers to plates prepared for flat-bed presses.

When plates are prepared for an offset press the operation is the same except that the drawing is photographed in the usual way, making a wet-plate negative, which is printed as a positive on a sensitized zinc plate so as to appear in reverse on the rubber blanket of the offset press and right on the final copy. One advantage of the offset press is that it will print clear, sharp lines on any rough or hard paper.

When the subject is too large for an ordinary plate, impressions are taken from two or more smaller plates with special paper and ink and transferred to a larger plate. When several colors or printings are required to complete a job, the color plates are frequently transferred to stone, from which they are printed.¹ Two Government establishments have discarded the use of stone entirely. Metal plates are less cumbersome to handle, require less space, and are not in danger of breakage as stones are. Imagine a stone 3 to 4 inches in thickness, with a surface up to 36 by 52 inches, requiring at least two men to handle.

The possibilities of this process are almost unlimited, but the best and speediest results are obtained when work is drawn in black on white paper or tracing cloth larger by one-third or one-half (linear) than it is to appear in reproduction.

This process can be used in connection with lithography when desirable. The largest plate used is 44 by 64 inches. It is the most economical process for large quantities. An unlimited number of copies can be taken from a plate at the rate of 600 to 700 per hour.

Preparation.—Drawings for any process should be done in waterproof India ink, usually on a larger scale than the reproduction (farm-unit and supplemental plats are exceptions). Lettering should be in proportion and all lines firm and black. White material or tracing cloth should be used.

Except when they are tracings required for future use to make blue prints, additions may be made to the drawings by overlaying titles, tabulations, or notes, and any portion which is to be omitted may be covered with blank paper. Much of the lettering on published project maps and town-site plats is done by pasting type matter on the drawing. Typewritten tabulations are used on farm-unit plats. Supplemental plats and Denver office standard designs are lettered entirely by hand. Colored inks are deceptive and should not be used unless one is willing to have the negative cutter repeat the work. If red opaque paint is used, the lines will appear heavier than intended when converted into black; if transparent ink is used, it disappears almost entirely. Where the Reclamation

¹A further reference to lithography will be made in a future article.

Service manual mentions the use of colors on maps, it refers to maps that are to be redrawn in the Washington office before reproduction.

When a two-color drawing is to be reproduced in the two colors in which it is drawn, two negatives may be made and the lines to appear in black eliminated from one and those to appear in color eliminated from the other. In order to save time, specification drawings are generally printed in black only.

The most difficult drawings to reproduce from metal plate are those on orange cross-section tracing cloth or paper, especially when drawn on the dull side. In this case all orange lines have to be painted out and every fifth line recut; otherwise the lines when reduced appear as smudgy gray tint; yet these same drawings make good blue prints.

Maps and drawings are seldom enlarged or reduced by hand nowadays. Modern photographic methods fill the requirement much more economically and speedily.

NEW CHIEF CLERK FOR DEPARTMENT OF THE INTERIOR.

John Harvey, who has held the position of Assistant to the Secretary of the Interior under Secretary Payne, has been appointed Chief Clerk of the Department of the Interior, effective January 16, 1921, to succeed E. J. Ayers, who has resigned to enter private business.

Mr. Harvey was born in Denison, Tex., December 8, 1877. He was employed in the general offices of the Missouri, Kansas & Texas Railway Co. at Greenville, Tex., when appointed to a clerical position in the Pension Office, August 21, 1901. After serving about two weeks in the Pension Office he was transferred to the Secretary's Office, Lands and Railroads Division, and made stenographic reports of hearings for five years before Ethan Allen Hitchcock, Secretary of the Interior. In 1908 he was appointed private secretary to Hon. Frank Pierce, First Assistant Secretary of the Interior, and served in the same capacity with Hon. Samuel Adams, with Hon. Andrieus A. Jones, now United States Senator from New Mexico, and with Hon. Alexander T. Vogelsang, until appointed Chief of the Division of Publications, Secretary's Office, May 25, 1917.

On January 14, 1918, Mr. Harvey was appointed Chief of the Division of Appointments, Mails, and Files, Secretary's Office, and on March 15, 1920, Assistant to the Secretary by the present Secretary, Hon. John Barton Payne. He was appointed Chief Clerk of the Department December 31, 1920, to be effective January 16, 1921.

Mr. Harvey is fond of tennis and fishing.

He has succeeded as Assistant to the Secretary by Charles W. Nestler, former assistant to First Assistant Secretary Vogelsang.

RECLAMATION ABROAD.

Irrigation in Mesopotamia.

IN June, 1919, the ancient canal Saqlawiyah, near Fellujah, was formally reopened and the waters of the Euphrates were allowed to pass through. This canal follows approximately the course of the ancient Nahr Isa Canal, once navigable, which was constructed in 762 A. D. The present canal provides water enough for the irrigation of 70,000 acres in winter and 36,000 acres in summer. The level of the bed of the canal, which is 25 feet wide, will allow a depth of 5 feet of water flowing through the regulator when the river is at its lowest, and in times of flood this depth can be increased to 10 feet.

Some idea of the magnitude of the work done to improve and enlarge the irrigation system of Mesopotamia may be gathered from the following budget for the year ending March 31, 1920: Irrigation maintenance, \$648,800; irrigation new works, \$2,358,388; flood protection maintenance, \$778,560; flood protection new works, \$389,280; buildings and roads maintenance, \$194,640; total, \$4,369,668.

The Yousoufieh Canal has been reopened, bringing water from the Euphrates to the vicinity of Bagdad and greatly increasing the production of vegetables for the Bagdad market. Other canals opened, considerably increasing the cultivated area of Mesopotamia, are: New Khalis Canal, from the Diala River; Beni Hassan Canal, from the Euphrates River; and the Georgivah Canal, from the Euphrates River.—*Commerce Reports.*

Reclamation Project in Northeastern Brazil.

Decrees have been issued approving the contracts by the Inspectoria de Obras Contra as Seccas for the administration of the construction of dams, irrigation canals, and other work judged necessary for the execution of the reclamation project. It is planned to begin construction as soon as equipment and men can be brought on the ground. Government funds for the completion of the project have been arranged. The Federal Government has 40,000 contos cash allotted to reclamation work, and the remainder of the 200,000 contos appropriated will be raised by a 2 per cent tax on Brazil's gross revenue, which it is estimated will bring another 40,000 contos per year; thus the total amount will be available in four or five years.—*Commerce Reports.*

Taking your hat off when the band plays the national anthem doesn't get you anything with Uncle Sam unless you pay your income tax.

HUNTING SANS FIREARMS.

By N. B. Hunt, Office Engineer, Flathead (Indian) Project, Mont.

THE familiar metaphorical artifice of killing two birds with one stone narrowly missed literal demonstration on the Flathead project not long ago. In fact, realization would have been attained but for the respective deficiency and excess of birds and stones in the summary of animals and materials. The news value of the story, however, is not vitiated by this disregard of precedent.

The incident occurred during a visit of the project manager and others to the outlet canal of the South Pablo Reservoir for a purpose other than that implied by this narrative.

It was the open season for duck and a number of veterans had taken refuge in the outlet conduit. The approach of the party rendered these quarters undesirable from the duck viewpoint and action was taken without delay. Respect for the gastronomical status of duck impelled Mr. Moritz to seize a convenient stone and project it in a direction calculated to furnish data on impact. The scientific results were gratifying in that the motion of the duck was strictly in accordance with the second law. The victim sank into the water of the canal and it is presumed the stone did likewise, although evidence is lacking. The actions of the duck following its reappearance called for a renewal of the offensive, to which Mr. Moritz responded with a second stone and undiminished accuracy. Upon receipt, the duck lost interest in the proceedings and lay motionless within reach from the shore, to which point the remains were presently transferred.

Although the ratio, two stones to one bird, may seem to indicate an efficiency of only one-fourth that recommended for the best practice, it must not be forgotten that this bird was a duck, which should justify the proportion:

$$\frac{1 \text{ stone}}{2 \text{ birds}} = \frac{2 \text{ stones}}{1 \text{ duck.}}$$

KLAMATH IRRIGATION DISTRICT ENDORSES WORK OF RECLAMATION SERVICE.

Mr. A. L. Wishard, secretary of the Klamath irrigation district, Klamath project, Oregon-California, has transmitted the following resolution to Secretary Payne, Director Davis, and Chief Engineer Weymouth:

Whereas the United States has, through the Reclamation Service, expended some \$3,000,000 in reclamation work in Klamath County, upon what is known as the Klamath project, and has brought under irrigation approximately 50,000 acres of land, and measures are now being taken to complete the project, which will mean the reclamation and irrigation of from 100,000 to 150,000 more acres of land within this county, and

Whereas the reclamation work on the Klamath project has contributed in a large measure to the development and prosperity of this community, and

Whereas during the years of service by the Reclamation Department on the project there has been a great deal of unfair and unwarranted criticism of the work it has done,

Now, therefore, we, the undersigned, G. W. Offield, A. L. Marshall, and R. E. Bradbury, comprising the board of directors of the Klamath irrigation district, feel that it is only fair and proper that we should go on record at this time as follows:

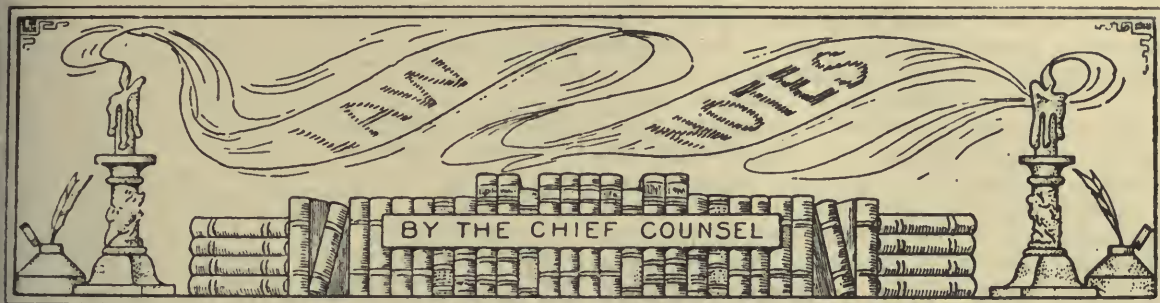
We are familiar with the development of this project from the beginning, and we find that while there have been mistakes made by the Reclamation Service which must necessarily be the case when a pioneer engineering work of such magnitude is undertaken; and the further fact is realized that the Reclamation Service was compelled to act on insufficient data, and was confronted with problems which could be solved only by years of careful study and experience; nevertheless, a great many of the charges and much of the criticism, when carefully investigated, have proven to be without merit. We find the same true of the criticism directed against the officers and officials who have represented the Reclamation Service on this project.

We wish therefore, at this time, to indorse the work of the Reclamation Service, and its representatives on this project, and particularly those officials of the service whom we have met in the transaction of the business of the district and water users' association, during the existence of our project.

We had grown to respect and esteem our former project manager, Mr. J. B. Bond, and questioned whether we would be fortunate enough to secure the services of another man of his character; but we find in Mr. Newell, our present manager, the same type of a man. He has proven himself a capable project manager, an able executive, and a man of unquestionable integrity and fairness. We respect him in his official capacity, and appreciate him as a friend and fellow citizen.

We feel that a great majority of the people of the Klamath project would unhesitatingly join with us in this expression of appreciation of the work of the Reclamation Service were they given an opportunity.

GEORGE W. OFFIELD,
President, Klamath Irrigation District.
A. L. MARSHALL,
Director, Klamath Irrigation District.
R. E. BRADBURY,
Director, Klamath Irrigation District.
F. D. FLETCHER,
Attorney, Klamath Irrigation District.
A. L. WISHARD,
Secretary, Klamath Irrigation District.



Operation and Maintenance Deficits Prior to 1914 Held Collectible.

DECEMBER 17, 1920. solicitor for the Department of the Interior, Charles D. Mahaffie, rendered an opinion to the effect that the operation and maintenance deficit arising on the Belle Fourche irrigation project in South Dakota prior to the enactment of the extension act of August 13, 1914 (38 Stat., 686), was not extinguished by that act and is collectible. This opinion was approved by the Secretary of the Interior on December 18, 1920, in letter transmitting the same to the Director of the Reclamation Service. The Secretary's letter and solicitor's opinion follow:

DEPARTMENT OF THE INTERIOR,
Washington, December 18, 1920.

The DIRECTOR, U. S. RECLAMATION SERVICE.

DEAR MR. DIRECTOR: I transmit herewith for your information and guidance a copy of the opinion of the solicitor, dated the 17th instant, as to whether the accrued deficit on the Belle Fourche project, on account of operation and maintenance charges, was extinguished by the act of August 13, 1914 (38 Stat., 686).

Cordially, yours,

JOHN BARTON PAYNE,
Secretary.

DEPARTMENT OF THE INTERIOR,
OFFICE OF THE SOLICITOR,
Washington, December 17, 1920.

The Honorable the SECRETARY OF THE INTERIOR.

DEAR MR. SECRETARY: My opinion has been requested on the question as to whether deficits on the Belle Fourche reclamation project accruing on account of operation and maintenance charges, that is excess of costs over returns which accrued prior to the passage of the reclamation extension act of August 13, 1914 (38 Stat., 686), must be accepted as a loss to the reclamation fund, or in other words whether this accrued deficit was extinguished and canceled under the provisions of the act referred to.

It is my understanding that these deficits originate from two causes—first, failure to collect the operation and maintenance charges announced by public notice and, second, differences between the estimate upon

which the operation and maintenance charges announced by public notice are based and the actual cost of operating and maintaining the project. Deficits in the former class are much the smaller of the two and arise from inability to make collections on account of seepage, abandonment of entries, and for other reasons, while deficits in the latter class arise because of error in estimates of cost and because of the actual impossibility from a practical standpoint of assessing charges high enough at the particular time to return the total cost of operation and maintenance. In the early years of a project the acreage subject to operation and maintenance charges is necessarily small, but nevertheless a large system based upon a completed project must be maintained; also, the water users do not then have their full acreage under irrigation and the returns are low so they can not carry the full burden on such a small producing area.

I further understand that the accrued deficit prior to 1914 on the Belle Fourche project amounts to approximately \$100,000, and a total for all projects of over \$1,250,000.

The reclamation act of June 17, 1902 (32 Stat., 388), provides that after the Secretary of the Interior shall have determined that any project is practicable, and has let contracts for the construction of same, he shall give public notice of the lands irrigable under such project; also of the charges which shall be made per acre upon homestead entries, and upon lands in private ownership, which may be irrigated under the project. It is further provided that "the said charges shall be determined with a view of returning to the reclamation fund the estimated cost of construction of the project, and shall be apportioned equitably." The law makes no express provision for the collection of any operation and maintenance charges as distinguished from construction charges, but the Supreme Court held in the case of *Swigart v. Baker* (229 U. S., 187), that a fundamental principle of the law is that the cost of the construction of a project shall be charged against the land within its irrigable limits, and that this cost is not limited to building, but may and does include the preservation and maintenance of what has been built up to the time it is surrendered to the water users. As pointed out by the court, if the costs of operation and maintenance were not re-

turned the result would be a constant and heavy diminution of the reclamation fund, which Congress did not intend. As remarked by the court, "that fund * * * was not intended to be diminished for the benefit of any one project; but, without increase by interest and undiminished by local expenses, was again to be used for constructing other works." Manifestly, this being true, an erroneous or a mistaken assessment or a failure on the part of the officers administering the law to assess an adequate annual charge or to fully collect such charge can not legally operate as a donation of Government property to those for whom a project is built. In my opinion, where such a deficit occurred prior to the passage of the act of August 13, 1914, *supra*, it was entirely competent for the Secretary to exact payment thereof, and secure reimbursement of the fund by adding the deficit to the charges for succeeding years, and without first procuring the consent of the water users to the added charge.

Charges assessed under the act of June 17, 1902, *supra*, attach to the lands themselves and become fixed charges thereon in the nature of a lien. See instructions of January 18, 1908 (36 L. D., 256). Section 3 of the act of August 9, 1912, entitled "An act providing for patents on reclamation entries, and for other purposes" (37 Stat., 265), provides that upon full and final payment being made of all amounts due on account of the building and betterment charges, a certificate shall issue on request evidencing the fact and that the lien upon the land has been to that extent satisfied and is no longer of any force, but the lien for annual charges for operation and maintenance is expressly retained and continued in effect. From the nature of things, such charges will fluctuate from year to year because of varying conditions. When announced in advance they must necessarily be purely tentative and can never at any given time be fully discharged because they attach annually to every irrigation system in perpetuity. One would have to be possessed of the power of divination to estimate them precisely.

The question arises then, did Congress having the existing situation in mind intend to make a gift of the accrued deficits to the water users by enacting the legislation of August 13, 1914, *supra*, commonly known as the reclamation extension act. Section 4 thereof provides "that no increase in the construction charges shall hereafter be made, after the same have been fixed by public notice, except by agreement between the Secretary of the Interior and a majority of the water-right applicants * * *." Section 5 relates to charges for operation and maintenance and fixes the basis for such charges. This section reads as follows:

That in addition to the construction charge, every water-right applicant, entryman, or landowner under or upon a reclamation project shall also pay, whenever water service is available for the irrigation of

his land, an operation and maintenance charge based upon the total cost of operation and maintenance of the project, or each separate unit thereof, and such charge shall be made for each acre-foot of water delivered; but each acre of irrigable land, whether irrigated or not, shall be charged with a minimum operation and maintenance charge based upon the charge for delivery of not less than one acre-foot of water: *Provided*, That whenever any legally organized water users' association or irrigation district shall so request, the Secretary of the Interior is hereby authorized, in his discretion, to transfer to such water users' association or irrigation district the care, operation, and maintenance of all or any part of the project works, subject to such rules and regulations as he may prescribe. If the total amount of operation and maintenance charges and penalties collected for any one irrigation season on any project shall exceed the cost of operation and maintenance of the project during that irrigation season, the balance shall be applied to a reduction of the charge on the project for the next irrigation season, and any deficit incurred may likewise be added to the charge for the next irrigation season.

Manifestly, this law looks to the future and provides a method for computing the charges for maintenance and operation thereafter to be assessed, but contemplates nevertheless that the reclamation fund shall remain intact and undiminished. True, there is no reference to deficits theretofore accrued, but I find nothing in the language of this section which would justify the conclusion that Congress intended to extinguish or cancel such accrued deficits or that a gift of those sums to the water users was contemplated. There certainly is no express language waiving the right of the Government to collect these deficits and I do not believe that the implication is warranted. The provision is little more than a legislative recognition and approval of the interpretation placed upon the basic law of 1902 and an adoption of that interpretation as fixed law.

It is my opinion, therefore, and I so advise you that payment of all such deficits should be exacted.

Cordially yours,

CHARLES D. MAHAFFIE,

Solicitor.

Litigation Affecting the Reclamation Service.

We present herewith a table showing by years and by projects the litigation affecting the Reclamation Service during the period from 1902 to 1920, inclusive.

This table shows a total of 373 actions and proceedings, 318 of which have been closed and 55 of which are pending. We have had 23 criminal cases, 79 condemnation proceedings, 66 suits relating to water rights, 99 concerning contracts, and 106 of a miscellaneous nature.

Of the completed cases, 286 have resulted not unfavorably to the Government, while 32 are classified as unfavorable. In nine of the latter, judgments against the United States aggregating \$587,514.68, were rendered. Two hundred and forty-three of the total

Litigation Affecting the Reclamation Service, 1902-1920.

TABULATED BY YEARS.

Year in which initiated.	Nature of litigation.					Cases initiated by the United States.				Cases not initiated by the United States.				Cases completed.								Total number completed cases.	Total number cases pending.	Total number of all cases. ¹
	Criminal.	Condemnation.	Water rights.	Contracts.	Miscellaneous.	Indefinite in amount involved.			Definite in amount involved.	Indefinite in amount involved.			Definite in amount involved.	Unfavorable to the United States.				Not unfavorable to the United States.						
						Indefinite in amount involved.	Definite in amount involved.	Amount involved.		Indefinite in amount involved.	Definite in amount involved.	Amount involved.		Amount in judgment.	Indefinite in amount involved.	Definite in amount involved.	Amount involved.							
																		No.	No.	No.	No.			
1902.....			1							1							1			1	1			
1903.....																								
1904.....					1	1											1			1	1			
1905.....			6	4	11	10	1	\$150,000.00	7	3	\$57,468.37	3					14	4	\$207,468.37	21	21			
1906.....		4	2	1	7	10	1	2,117.13	3								13	1	2,117.13	14	14			
1907.....	1	4	4	1	2	4	3	36,507.50	5								9	3	36,507.50	12	12			
1908.....		6	4	1	7	2	2	58,415.60	2								9	2	58,415.60	11	11			
1909.....	1	3	6	5	8	6	11	1,201,946.05	6			3	1	\$1,250.00	\$1,250.00	10	9	1,101,946.05	23	23				
1910.....	12	4	6	8	13	27	4	432,507.99	9	3	135,761.96	13	2	83,320.00	83,174.60	23	5	484,949.95	43	43				
1911.....	3	6	1	7	15	13	7	72,187.54	9	3	65,852.50	2	2	85,947.55	78,378.42	22	8	52,092.49	32	32				
1912.....		6	7	18	6	16	8	28,075.00	7	6	1,625,906.00	2	2	832,049.44	331,436.53	17	7	247,579.54	28	9				
1913.....	1	5	4	7	9	9	6	65,129.50	6	5	369,204.47	1	1	100,531.86	21,275.67	12	10	333,802.11	24	2				
1914.....	1	15	3	2	1	7	10	5,378.27	4	1	91,803.33	1	1	91,803.33	71,999.46	11	10	5,378.27	22	26				
1915.....	1	6	3	1	4	4	5	162,709.00	3	3	134,995.00	1				6	6	12,704.00	13	15				
1916.....		5	2	9	8	9	11	5,263.76	1	3	19,500.00					10	12	9,763.76	22	24				
1917.....	1	3	5	5	4	6	6	8,116.31	5	1	1,902,588.00					8	6	8,116.31	14	18				
1918.....		3	3	11	7	5	5	24,139.18	12	2	6,159.50					9	7	30,298.68	16	8				
1919.....	2	3	5	12	7	6	8	47,011.39	7	8	37,656.14					9	6	24,421.39	15	29				
1920.....		6	4	7	3	5	10	11,105.63	4	1	1,275.00					1	5	1,907.85	6	14				
Total.....	23	79	66	99	106	145	98	2,310,609.85	91	39	4,448,170.27	23	9	1,194,902.18	587,514.68	185	101	2,617,469.00	318	55				

TABULATED BY PROJECTS.

PROJECTS.																				
Belle Fourche	2	1		7	1	5	2	\$82,276.68	2	2	\$243,997.27		1	\$82,000.00	\$82,000.00	7	2	\$17,421.93	10	1
Blackfoot											25,000.00							25,000.00	1	1
Boise	1	23	10	13	16	22	15	82,254.60	20	6	469,677.68	1				33	18	214,111.14	52	63
Carlsbad		2	5	1		7	1	160,000.00								6			6	2
Flathead	1		2	1	5	7	1	111.18	1							8	1	111.18	9	8
Garden City			1	2		1			1	1	9,271.86	1	1	9,271.86	9,271.86	1			3	3
Gore Canyon					2	2						1				1			2	2
Grand Valley			1	2	2	1			4			1				4			5	5
Hondo			5	3		3			3	2	25,320.00		1	1,320.00	1,174.60	6	1	24,000.00	8	8
Huntley				1			1	12,016.05								2	1	12,016.05	1	1
King Hill				2	1				3							2			2	3
Klamath	1	7	2	2	5	9	5	53,283.00	2	1	1,275.00					9	5	53,283.00	14	17
Lower Yellowstone	1	1	1	8	1	1	9	96,050.90	1	1	34,852.50		1	34,852.50	27,283.37	2	9	96,050.90	12	12
Milk River	1	2	3	1	1	4	3	3,366.97	1							5	3	3,366.97	8	8
Minidoka		5	5	3	10	6	7	110,407.50	8	2	128,648.00	3				13	6	137,200.50	22	23
Newlands		3	5	1	16	11	2	324,000.00	4	8	229,835.00	2				10	3	524,500.00	15	25
North Dakota pumping					1	1										1			1	1
North Platte	1	2	3	1	3	2	2	120,750.00	2	4	359,973.82		1	100,531.86	21,275.67	2	4	255,191.96	7	10
Okanogan		3	6		1	6			4			1				7			8	2
Orland						1													1	1
Rio Grande	12	8	3	5	5	17	10	657,746.86	4	2	5,159.50	11				8	9	655,096.67	28	33
St. Mary storage		1			3	1	1	17,075.00	2							3	1	17,075.00	4	4
Salt River	1	1	3	2	7	2	3	9,593.41	4	5	67,990.73					5	7	67,584.14	12	14
Shoshone	1	1	2	6	3	4	6	267,389.70	2	1	822,777.58		1	822,777.58	322,164.67	4	5	267,356.61	10	13
Strawberry Valley			1	3		1			3							2			2	4
Sun River			1	6			6	1,947.08	1							1	5	1,857.08	6	7
Umatilla		1	2		8	3			8							11			11	11
Uncompahgre		7	2	8	3	9	7	217,625.00	3	1	30,000.00	1				11	4	202,625.00	16	20
Yakima	1	9	2	20	8	18	16	94,615.92	5	1	91,803.33	1	3	144,148.38	124,344.51	20	15	43,520.87	39	49
Yuma		2		1	3	1	1	100.00	3	1	1,902.58					3	1	100.00	4	6
Total.....	23	79	66	99	106	145	98	2,310,609.85	91	39	4,448,170.27	23	9	1,194,902.18	587,514.68	185	101	2,617,469.00	318	55

¹ An action or proceeding in which more than one appeal has been taken is nevertheless treated as a single case.

number of suits were initiated by the United States, and 130 were not. Two hundred and thirty-six of the cases were indefinite in the amount of money concerned, while the remaining 137 involved a total sum of \$6,758,780.12.

The year 1910 was the banner year for lawsuits, having 43 to its credit. The Boise project in Idaho is charged with 63 actions and proceedings, which is the largest number for any one project. The Yakima project in Washington comes next, with 40.

BOOK REVIEW.

THE FLOW OF WATER IN CONCRETE PIPE. By Fred C. Scobey, Senior Irrigation Engineer, Washington, D. C., United States Department of Agriculture. Paper, 6 by 9 inches; pp. 100; illustrated.

AN engineer recently called attention in print to the incontrovertible fact that any of the formulas that have been proposed for the flow of water in pipes would give a correct result in every case if only the proper coefficient were used. This statement does not overemphasize the practical importance of the determination of proper coefficients for this class of channels. Such a need in the somewhat allied problem of the determination of flow in open channels has been met by the Kutter formula, a formula which has probably been flouted more boldly in theory and bowed down to more abjectly in practice than any similar work of the hand of man.

Kutter's formula determines the value of C in the Chezy formula—but only by introducing another coefficient n , which coefficient is well understood to be itself a variable under certain influences not at all related to the roughness of the channel lining. As a result of recent investigation, we discover that Manning's formula, proposed 30 years ago, when used with Kutter's n will, within the range of ordinary practice, produce at least equally reliable results and with comparatively little labor.

The argument of simplicity advanced by the Manning advocates, however, really matters little now. Most engineers, as in the design of reinforced concrete beams, have their own graphical charts—and can see little virtue in those devised by others—while for engineers preferring the refinement of calculation permitted by the use of several significant figures, tables are available all the way from Trautwine's handbook covering all slopes and values of r in the compass of two pages to the 130-page volume published by the Texas State Reclamation Department, giving velocities for thirty slopes with values of n ranging from .006 to .080 and of r from 0.2 to 50 feet. Nor should we omit mention of the "Hydraulic and Excavation Tables" published by the Reclamation Service, which cover quite fully all problems met in the study of ordinary irrigation canals.

Mr. Scobey's previous work in the field of irrigation engineering investigation is well known, especially his

bulletin on wood-stave pipes published in 1916,¹ in which he proposed a formula which has proven of much value in the design and investigation of such pipe. That the present work does not result in a single formula equally definite and comprehensive points to no lack of similar merit in the work reported or in the conclusions reached.

Accepting the fact that the relation of friction loss to velocity and pipe diameter may be represented by an equation of the general form

$$H = Kd^x V^y$$

and plotting logarithmically all available experimental results, including a large number by the author himself, satisfactory exponents for d and V are determined, and the final form of equation offered is

$$V = C_s H^{0.5} d^{0.025}$$

in which the nomenclature is as follows:

V = mean velocity in feet per second.

H = friction loss in feet per 1,000 linear feet of pipe.

d = mean inside diameter of pipe in inches.

C_s = author's coefficient.

The coefficient C_s is found to vary widely, on account of the marked variation in resistance to flow offered by different types of construction, all of which have an equal right to be known as concrete pipe. Four general types of construction are recognized and a formula proposed for each, the classification and coefficients recommended by the author being as follows:

"Class 1: $C_s = 0.267$. For old California cement pipe lines. It appears to have been the general practice throughout southern California during the early eighties to lay the pipes with a generous supply of mortar and make little or no effort to remove the 'mortar squeeze' at the joints; hence, these pipes, even though perfectly clean, offer great retardation to the flow of water. This coefficient is also recommended for pipes of class 2 used to convey sewage. The present practice is to wipe all joints carefully, and the resulting surface approaches that of class 2.

"Class 2: $C_s = 0.310$. For modern 'dry-mix' concrete pipe and monolithic concrete pipe or tunnel linings made over rough wood forms. Also for surfaces as left by cement-gun process. This coefficient should

¹ U. S. Dept. of Agriculture Bulletin No. 376, The Flow of Water in Wood Stave Pipe, by Fred. C. Scobey.

be used for pipes as commonly made at the present time in the west coast States; that is, in 2-foot sections, with a dry mixture, afterwards washed with cement mortar on the inside, the work of manufacture and laying being done by contract under little or no inspection. Under favorable conditions, such as clear water to be conveyed, carefully made joints, and thorough inspection, this class may be made to approach class 3, but unless sure of his conditions the designer should use class 2. This is especially true for pipes less than 12 inches in diameter, because of the difficulty in making smooth joints.

"Class 3: $C_s=0.345$. For small 'wet-mix' pipe in short units; for 'dry-mix' pipes in long units; for average monolithic pipe made on steel forms. These pipes may be evenly washed with cement mortar or asphaltum. For small cement-lined iron pipes and for concrete pipe made under pressure with interior coating of neat cement applied by a mechanical 'trowel.' To be used for pipes of class 4 when the water contains detritus or the line is to be used to convey sewage.

"Class 4: $C_s=0.370$. For glazed-interior pipe lines; for large cement-lined iron pipes; for monolithic pipe lines where joint scars and all interior surface irregularities are removed. Particularly applicable to jointed lines of units made from wet, well-spaded concrete, deposited against oiled steel forms, and allowed to set firmly before forms are stripped. The glazed surface resulting from this treatment is to be untouched with brush or other 'wash' process, and the units are to be so uniform in shape that no shoulders are perceptible to the touch when the line is finished. The finished joints are to be practically as smooth as the rest of the pipe.

"This class covers only the highest grade of workmanship and materials. The specifications are rigid, but have been and can be attained commercially by an experienced organization. They are difficult to attain in a pipe less than 30 inches in diameter—too small to permit a man to work comfortably inside, and are probably prohibitive for sizes less than 12 inches in diameter. A few of the pipes upon which experiments were made appear to have coefficients higher than 0.370, but the writer (author) wishes to be conservative in recommending a coefficient that necessitates a surface so nearly ideal. That is to say, a better surface may be attained in construction than should be anticipated in design."

For estimating the capacity of concrete pipe lines on this basis, a diagram and several tables are offered covering the above range of coefficients, while by no means the least interesting portion of the bulletin is the brief discussion to which Kenneth Allen, Arthur S. Bent, F. C. Finkle, Allen Hazen, J. B. Lipincott, and H. D. Newell contribute.

Definite information as to the flow of water in concrete pipe has been far from plentiful in the past, as witness the frequent recourse had by designers to the Kutter formula, which was deduced from and is particularly applicable to open channel conditions. The work of the author in establishing a general equation for flow for this class of pipe, and especially a reliable range of coefficients to accompany the equation is a distinct service to the engineering profession.—C. A. B.

DECEMBER WEATHER IN THE WESTERN STATES.

By P. C. Day, United States Weather Bureau.

In spite of severe cold about Christmas time in the Rocky Mountain and Plains States, December was mainly mild, while there was much diversity of precipitation conditions. The first fortnight was mainly cool in the far Southwest, but decidedly warm for the season in the Plains region and Montana, and somewhat warmer than normal in other districts. From the middle of the month onward it was mainly cold in the Plateau States and to eastward, until a marked turn to warmer came during the final week. The month averaged usually 2° to 5° warmer than normal in the Plains States and near the Canadian border, and elsewhere in the West a little warmer than normal, save from western Wyoming southward to western New Mexico, and thence westward to the coast of southern California, where the month averaged a little colder than normal.

The rain and snow were fairly well distributed through the month in most sections, but the Pacific States had most of their precipitation during the first fortnight and near the end of the month, while the Rocky Mountain and Plains regions had the greater part of theirs between the 10th and 22d. The total falls of the month were above normal in the northern half of California and most parts of Oregon, in many parts of Washington, Idaho, and Utah, and in central Colorado. In most other districts they were either below normal or but slightly above. In the westernmost portions of the Plains there was nearly everywhere a deficiency; and in southern districts, from the Gulf coast to the Pacific, there was decidedly little, many southern counties of New Mexico and Arizona having no rain or but a mere trifle.

The weather of the month was unfavorable in some respects, the great amount of rainy weather from central California northward being a hindrance to outdoor work; much of the rice in California had matured late, and the rains prevented harvesting, resulting in marked loss. The snow and severe cold near Christmas was bad for stock in many States, especially Wyoming; while in the southern States stock had rather poor range, because of dryness. Truck in California and fruit and winter grains in nearly all districts had rather favorable conditions.

The words "peace and victory" will have a holier meaning when you have paid your income tax.

Remember how you cheered on Armistice Day? Paying your income tax is evidence of real patriotism.

IRRIGATION STATISTICS, FOURTEENTH CENSUS.

The Director of the Census announces, subject to correction, the following preliminary statistics on irrigation for the counties named. Similar statements for

other counties will be issued as soon as the figures are available and will be published from time to time in the RECLAMATION RECORD.

Irrigation by counties, 1920 and 1910.

State and county.	Acreage to be irrigated by works either completed or under construction.			Acreage to which existing works are capable of supplying water.			Acreage irrigated.			Acreage available for settlement in 1920. ²
	1920	1910	Increase. ¹	1920	1910	Increase. ¹	1919	1909	Increase. ¹	
Arizona:										
Coconino.....	2,040	3,223	- 1,183	1,902	1,183	719	1,479	901	578	-----
Gila.....	7,012	4,233	2,779	2,374	3,272	- 898	1,797	2,778	- 981	-----
Graham ³	41,918	-----	-----	34,354	-----	-----	32,400	-----	-----	4,060
Greenlee ⁴	12,948	-----	-----	7,641	-----	-----	6,594	-----	-----	-----
Mohave.....	3,395	40,624	-37,229	2,672	8,726	- 6,054	2,342	1,688	654	-----
Navajo.....	11,956	24,997	-13,041	6,596	8,270	- 1,680	5,832	6,458	- 626	-----
Santa Cruz.....	7,162	6,872	290	3,413	4,895	- 1,482	2,608	4,773	- 2,165	-----
Yavapai.....	17,108	16,588	520	13,382	9,538	3,844	11,566	8,571	2,995	-----
Yuma.....	128,940	177,217	-48,277	64,481	15,687	48,794	49,855	7,662	42,193	-----
Colorado:										
El Paso.....	35,090	41,438	- 6,348	22,047	28,214	- 6,167	18,143	21,354	- 3,211	2,200
Idaho:										
Boise ³	14,229	-----	-----	8,569	-----	-----	7,608	-----	-----	193
Cassia ³	148,283	-----	-----	129,419	-----	-----	113,527	-----	-----	3,181
Montana:										
Big Horn ⁴	87,765	-----	-----	60,591	-----	-----	48,306	-----	-----	-----
Carbon ³	155,375	-----	-----	147,185	-----	-----	100,263	-----	-----	-----
Cascade.....	144,486	81,279	63,207	45,123	50,334	- 5,211	15,044	25,063	-10,019	-----
Custer ³	25,872	-----	-----	21,960	-----	-----	8,469	-----	-----	-----
Fergus ³	91,130	-----	-----	76,995	-----	-----	29,242	-----	-----	2,615
Hill ⁴	13,824	-----	-----	12,233	-----	-----	2,508	-----	-----	-----
Jefferson.....	86,036	37,494	48,542	45,553	26,373	19,180	24,896	23,314	1,582	-----
Lewis and Clark.....	92,847	107,789	-14,942	67,495	55,317	12,178	34,270	38,391	- 4,121	-----
Meagher ³	60,278	-----	-----	48,175	-----	-----	24,775	-----	-----	-----
Musselshell ⁴	19,255	-----	-----	11,659	-----	-----	4,118	-----	-----	610
Park ³	125,717	-----	-----	88,940	-----	-----	52,894	-----	-----	-----
Phillips ⁴	85,032	-----	-----	35,248	-----	-----	28,447	-----	-----	24,555
Rosebud ⁴	36,733	-----	-----	30,670	-----	-----	20,714	-----	-----	-----
Stillwater ⁴	49,434	-----	-----	44,926	-----	-----	33,039	-----	-----	260
Teton ³	222,121	-----	-----	109,236	-----	-----	55,491	-----	-----	15,345
Wheatland ⁴	48,091	-----	-----	37,146	-----	-----	14,478	-----	-----	-----
Nebraska:										
Scotts Bluff.....	251,647	224,185	27,462	178,313	191,206	-12,893	173,245	100,301	72,944	-----
Wyoming:										
Albany.....	332,455	355,033	-22,578	218,270	221,225	- 2,955	114,220	151,926	-37,706	-----
Carbon.....	191,280	191,486	- 206	149,002	163,394	-14,392	121,405	131,749	-10,344	5,000
Goshen ³	138,452	-----	-----	77,974	-----	-----	55,461	-----	-----	26,353
Laramie ³	50,590	-----	-----	29,980	-----	-----	24,160	-----	-----	-----
Lincoln ⁴	289,121	-----	-----	245,777	-----	-----	161,332	-----	-----	2,413
Platte ⁴	131,726	-----	-----	108,999	-----	-----	66,888	-----	-----	48,500
Sweetwater.....	57,591	90,614	-33,023	46,805	22,667	24,138	14,010	10,798	3,212	21,452
Uinta ³	221,595	-----	-----	148,499	-----	-----	102,895	-----	-----	10,637

¹ A minus sign (-) denotes decrease.

² To be supplied with water by works either completed or under construction.

³ Boundaries changed since 1910; hence no comparative figures can be given.

⁴ Organized since 1910; hence no comparative figures can be given.

BULLETINS FOR THE FARMER.

Distributed by the Department of Agriculture,
Washington, D. C.

FARMERS' BULLETINS.

No.

1115. Selection and preparation of fowls for exhibition.

1158. Growing and utilizing sorghums for forage.

1172. Farm slaughtering and use of lamb and mutton.

1174. One-register (pipeless) furnaces.

1182. Farm inventories.

1183. The care of leather.

DEPARTMENT CIRCULAR.

148. The farm woman's problems.

Distributed by State Experiment Stations.

UTAH CIRCULAR, LOGAN, UTAH.

42. How to cull a flock of hens.

MONTHLY PROGRESS REPORTS FOR DECEMBER.

Monthly conditions of principal Reclamation Service reservoirs for December, 1920.

[Elevation above sea level.]

State and project.	Reservoir.	Available capacity, in acre-feet.	Elevation.		Storage in acre-feet.			Out-flow in acre-feet.	Elevation of water surface.		
			Spill-way crest. ¹	Lowest gate sill. ²	Beginning of month.	End of month.	Maximum.		Beginning of month.	End of month.	Maximum.
Arizona, Salt River.....	Roosevelt ³	41,305,000	2128	1903	945,347	934,892	950,036	10,455	2100.62	2099.87	2100.95
California, Orland.....	East Park.....	51,000	1199.68	1111.68	12,260	38,380	38,380	.....	1168.78	1192.21	1192.21
Idaho:											
Boise.....	Arrowrock.....	280,600	3211	2956	29,050	49,050	49,050	37,722	3071.8	3095.5	3095.5
	Deer Flat.....	177,000	2518	2488	65,796	81,220	87,913	.....	2503.95	2506.75	2507.28
Minidoka.....	Lake Walcott.....	95,180	4245	4226	84,700	84,010	84,470	.....	4244.1	.....	.....
	Jackson Lake.....	847,000	6769	6750	214,390	239,160	239,160	.....	6741.6	.....	.....
Montana:											
Milk River.....	Nelson.....	27,000	2212	2200	19,300	17,200	19,300	.....	2209.3	2208.4	2209.3
St. Mary Storage.....	Sherburne.....	33,000	4788	4720	.....	.....	.....	.....	.....	.....	.....
Sun River.....	Willow Creek.....	16,700	4130	4085	11,696	12,209	12,209	.....	4124.7	4125.3	4125.3
Nebraska- Wyoming, North Platte.....	Pathfinder.....	1,070,000	5852	5670	670,840	691,370	691,370	920	4177	4175.7	4177
	Lake Alice.....	11,400	4182	4159	7,829	6,999	7,829	.....	4119.9	4119.1	4119.9
	Lake Minatare.....	60,700	4125	4074	50,191	48,608	50,191	.....	4119.9	4119.1	4119.9
Nevada, Newlands.....	Lake Tahoe.....	120,000	6230	6224	.....	.....	.....	9,600	6224.32	6224.74	6224.75
	Lahontan.....	290,000	4162	4060	100,900	125,400	125,400	.....	4135.8	4141	4141
New Mexico:											
Carlsbad.....	McMillan.....	45,000	3267.7	3241.6	17,230	23,000	23,000	.....	3261.8	3263.2	3263.3
Rio Grande.....	Elephant Butte.....	2,638,800	4407	4321.5	1,743,544	1,723,935	1,744,437	35,974	4381.6	4381.1	4381.6
Oregon, Umatilla.....	Cold Spring.....	50,000	621.5	560	19,850	32,750	32,750	42	596.94	608.88	608.88
Oregon-California, Klamath.....	Clear Lake.....	462,000	4540	4514	258,800	266,000	266,000	.....	4531.65	4532.02	4532.02
South Dakota, Belle Fourche.....	Belle Fourche.....	203,000	2975	2920	141,340	153,400	153,400	.....	2966.9	2968.2	2968.2
Utah, Strawberry Valley.....	Strawberry.....	250,000	7558	7517	196,000	198,000	238,000	.....	7550.5	7550.8	7558
Washington:											
Okanogan.....	Conconully.....	13,000	2287	2232	886	1,250	1,250	.....	2248	2250	2250
Yakima.....	Bumping Lake.....	31,000	3426	3386	19,185	12,265	19,185	6,920	3413.6	3406.3	3413.6
	Lake Clealum.....	22,800	2134	2122	25,505	27,660	27,660	.....	2134.7	2135.5	2135.5
	Lake Kachess.....	210,000	2258	2192	124,470	142,615	142,615	.....	2234.3	2229.1	2239.1
	Lake Keechelus.....	152,000	2515	2425	39,765	53,415	53,415	.....	2455.5	2465.1	2465.1
Wyoming, Shoshone.....	Shoshone.....	456,600	5360	5132.3	384,167	316,618	384,167	95,028	5348.5	5336.3	5348.5

¹ Or maximum storage.² Or zero storage.³ Zero water depth at elevation 1902.2.⁴ Amount of silt shown by silt survey deducted from original capacity.⁵ Proposed regulation.⁶ Estimated low-water limit under proposed plan of regulation.⁷ Vested power draft.

SALT RIVER PROJECT, ARIZONA.

Operation and maintenance of irrigation system.—Little water was run in the canals during December, as the demand for irrigation water was light.

Two maintenance crews were in the field and the following statement shows the average number of men and stock employed and the results accomplished: Average number of men, 26; average number of stock, 2; miles main canals cleaned, $\frac{1}{2}$; miles brush cut along main canals, 18; miles laterals cleaned, $15\frac{1}{2}$; number of new structures installed, 6; number of old structures repaired, 61; riprap placed, 286 feet; dirt fill placed, 344 cubic yards; concrete placed, 3 cubic yards; 24-inch concrete pipe placed, 52 feet; 14-inch concrete pipe placed, 56 feet; 24-inch corrugated pipe placed, 25 feet; Salt Canal flumed, 200 linear feet.

A daily average of 17 men and $6\frac{1}{2}$ head of stock was used during December widening Eastern Canal, working on widening structures and backfilling; 117 cubic yards of concrete were placed in the siphon, and 21 cubic yards in the culvert; 200 cubic yards of backfill were placed on the siphon.

The Monighan 2-yard dragline moved 15,383 cubic yards of excavation, 2,000 cubic yards of spoil bank, and 1,640 cubic yards of borrow.

The P & H $\frac{1}{2}$ -yard dragline bermed 1,385 linear feet on the Arizona Canal in four working days.

The Ruth dredger bermed 2,420 linear feet on Canal 12 South, in three working days.

The Austin trencher completed trench excavation for Cross Cut Drain construction on December 8, having dug 1,400 linear feet. After being overhauled it was moved to the Laveen Drain construction, where 3,350 linear feet were dug. In connection with this work 1,400 linear feet of 18-inch concrete pipe were laid and 1,000 linear feet backfilled.

Work was continued on the new pump houses for subdrainage, five being completed during the month.

Operation of power system.—The total power generated during December was 3,908,430 kilowatt hours.

The Roosevelt power plant operated 512 hours, or 69 per cent of the month, this plant being shut down from November 22 to December 10. The maintenance work started in November continued during the shut-down period. The repairs to the draft tube and discharge tunnel of Unit No. 3 were completed. New valves were installed on the thrust-bearing pumps.

The Cross Cut plant operated continuously, the Arizona Falls plant 12 $\frac{1}{2}$ hours, the South Consolidated plant 740.9 hours, or 99 per cent, and the Chandler plant 624.8 hours, or 84 per cent of the month.

The substations all operated without trouble. At the Phoenix substation the 45,000-volt current transformers were overhauled.

The pumps were operated as required. The pump at Battery No. 4 was overhauled.

Construction work, town of Mesa, old plant.—The installation of this equipment was completed during

the first part of the month and the unit placed in operation December 10.

Roosevelt Dam, south spillway.—All excavations were completed early in the month and all the submerged concrete work, amounting to approximately 538 cubic yards, was completed by December 10. Water was turned in the river on December 10. The backfilling was completed December 28, of which there were approximately 2,419 cubic yards of dry rockfill and about 350 cubic yards of dry masonry.

Office.—A total of 108,756.95 acres was entitled to irrigation water service on the 1st of January.—*C. C. Cragin.*

YUMA PROJECT, ARIZONA-CALIFORNIA.

December weather conditions were favorable; several heavy frosts occurred, but no rain fell during the month. Economic conditions were bad owing to the low price of cotton. Planting had not commenced and there was considerable uncertainty as to the nature of the crop for next year. Indications pointed to a decreased acreage in cotton, with possibly the introduction of different varieties, and to an increase in alfalfa and maize.

Construction.—On the East Drain Lateral the Bucyrus dragline was shut down for repairs most of the month but advanced 600 feet along the drain, excavating 6,200 cubic yards of earth. A timber bridge and a metal flume were built.

Operation and maintenance.—Three thousand four hundred acre-feet of water were delivered to users. Monighan dragline No. 1 continued work cleaning the Somerton Canal, advancing 0.8 mile and excavating

12,700 cubic yards of silt. Monighan dragline No. 2 continued work on the West Main Canal, cleaning 0.6 mile of canal and excavating 4,800 cubic yards of silt. A third Ruth machine was received and started work on the 14th. This machine cleaned 2½ miles of laterals, moving 2,700 cubic yards of silt; Ruth machine No. 7 cleaned 3¼ miles of laterals, moving 5,400 cubic yards of silt.

On the Indian reservation Ruth machine No. 6 cleaned 5 miles of laterals, moving 4,900 cubic yards of silt.

The maximum discharge of the Colorado River during the month was 9,000 second-feet, minimum 5,100 second-feet. On December 31 the gage height was 15.3 and the discharge 5,400 second-feet. The total discharge for the month was 452,000 acre-feet.

Boulder Canyon Reservoir.—Drilling was continued during the month. The topographic surveys were completed and the party disbanded. A party composed of the director, the chief engineer, the project manager, and Engineers C. C. Fisher and Harold Conkling inspected the dam site and the river. The work of completing the drilling was placed in charge of Engineer W. R. Young, of the Denver office, at the end of the month.

Imperial Valley investigations.—The field work was completed during the month and the office at El Centro closed. Office work on estimates and plans was continued at the Yuma office. Work on the soil survey is being continued and will probably be completed during January.

Official visitors were O. P. Morton, special assistant to the Attorney General, and E. A. Rowe, of J. B. Lippincott's office.—*W. W. Schlecht.*

Crop report, Salt River project, Arizona, for year ending Sept. 30, 1920.

[Data furnished by Salt River Valley Water Users' Association.]

Crop.	Acreage.	Yield.			Value.		
		Unit.	Average per acre.	Total.	Per unit.	Total.	Per acre.
Alfalfa.....	25,230	Ton.....	4	100,936	\$18.00	\$1,816,850	\$72.00
Barley.....	4,463	Cwt.....	18	80,334	2.75	220,920	49.50
Beans.....	94	Pound.....	950	89,300	.07	6,250	66.50
Berries.....	107					49,220	460.00
Cantaloupes.....	2,557	Crate.....	190	485,830	1.10	534,410	209.00
Cotton seed.....	142,320		600	85,395,000	.0075	640,460	4.50
Cotton lint.....		Pound.....	200	28,465,000	.4325	12,311,110	86.50
Fruit, citrus.....		do.....	7,000	11,823,000	.05½	650,270	385.00
Fruit, deciduous.....	1,398	do.....	10,000	13,980,000	.03½	489,300	350.00
Garden truck.....	936					234,000	250.00
Lettuces.....	503	Crate.....	275	138,325	2.50	345,810	687.50
Grain, sorghum.....	5,597	Cwt.....	20	111,940	2.50	279,850	50.00
Corn.....	2,084	Pound.....	1,800	3,751,200	.03	112,540	54.00
Oats.....	1,135	Cwt.....	19	21,565	3.00	64,690	57.00
Pasture.....	8,732					261,960	30.00
Potatoes.....	195	Pound.....	3,600	702,000	.014	9,830	50.40
Vineyard.....	264	do.....	7,000	1,848,000	.07	129,360	490.00
Watermelons.....	385	Cwt.....	160	61,600	1.10	67,760	176.00
Wheat.....	3,363	do.....	17	57,171	4.00	228,685	68.00
Asparagus.....	3	Pound.....				3,300	1,100.00
Sudan grass.....	1,245	Ton.....	6	7,470	12.75	95,240	76.50
Total acreage cropped (not including townsite areas).....	202,300						
Less acreage cropped twice.....	8,950						
Net acreage cropped.....	193,350						
Plus vacant land, including roadways, ditches, etc.....	5,536						
Plus home tracts, including house lots, corrals, etc.....	3,032						
Total acreage reported, less duplicated area.....	201,918						
Plus townsite acreage on which no crop was reported.....	3,146						
Total acreage receiving water service from project.....	205,064						
Total and average.....						18,551,800	96.00

¹ Field.

YUMA AUXILIARY PROJECT, ARIZONA.

During December the site of the B Lift pumping plant was cleared of brush and timber and a well put down to be used in construction work. About 7 miles of road were graded and made ready for the rock surface. The crushing plant at the rock hill in section 2 on the Mesa was put in repair for operation. George Co., contractors, working on the lateral system of the First Mesa unit, cut their forces some during the month. Their estimate for the month was 14,400 cubic yards of excavation. They will probably finish the work under their contract about January 15, 1921.—W. W. Schlecht.

ORLAND PROJECT, CALIFORNIA.

The weather during December continued unfavorable for outside operations. There were 13 rainy days during the month and the precipitation amounted to 4.48 inches. At the close of the month the seasonal rainfall was 9.86 inches, which is about 3½ inches above the average. The run-off of Stony Creek for the month was 108,000 acre-feet, as compared to 6,400 for December, 1919. The gates of the feed canal at East Park were closed on the 19th. It is probable that the canal will not need to be again operated this season. A second mixer was placed in operation on concrete lining on the 14th. The average force employed on lining work was 80 men and 26 head of stock, and the amount of lining placed 22,755 square yards. The maintenance force cleaned and repaired 19 miles of laterals. For most of the month the ground was too wet for farm work, and with the exception of oranges there were no crops to be harvested.—A. N. Burch.

GRAND VALLEY PROJECT, COLORADO.

Seasonable weather occurred throughout December with a light fall of snow on the 19th, of which very little remained at the end of the month. Conditions were favorable for construction and maintenance work and an ample supply of labor was available. Crops were all harvested early in the month. The yields were generally satisfactory, but prices continue low and markets poor. The tonnage of sugar beets was below normal.

Cleaning of laterals and necessary repairs were carried on until the ground froze too hard for efficient operations and the maintenance forces were reduced to a small gang engaged on structures and riprap. Excavation of drains in the Grand Valley Drainage District was continued throughout the month with three drag lines, and in addition the trenching machine was operated for the construction of 1,230 feet of closed drain. Approximately 1.7 miles of open drain were completed, involving the excavation of 47,000 cubic yards of material and the installation of one culvert and one road bridge.—A. W. Walker.

UNCOMPAHGRE PROJECT, COLORADO.

December weather conditions were favorable for repair work until the 11th, after which date all work was closed down except the brushing of canal banks and the repair of timber structures. The concrete repair work in the South Canal below Tunnel 3 and above the first of the seven drops was completed, and about three-fourths of the concrete floor between drops 2 and 3 of the seven drops was placed before the weather became too severe for con-

Preliminary crop estimate, Grand Valley project, Colorado, 1920.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	3, 140	Ton.....	9, 390	3.0	\$13.40	\$125, 600	\$40.04
Alfalfa seed.....	340	Bushel....	1, 142	3.4	9.75	11, 130	32.85
Apples.....	217	Pound.....	1, 146, 150	5, 300	.018	20, 645	95.10
Beets, sugar.....	2, 700	Ton.....	20, 340	7.5	12.10	246, 430	91.25
Beet tops.....	2, 700					11, 130	4.12
Corn, Indian.....	710	Bushel....	15, 875	22.4	1.26	20, 010	28.25
Corn fodder.....	805	Ton.....	1, 489	1.85	8.05	11, 990	14.90
Garden.....	86					8, 385	97.50
Hay.....	309	Ton.....	479	1.5	11.90	5, 700	18.50
Oats.....	1, 470	Bushel....	43, 410	29.5	.86	37, 250	25.30
Pasture.....	900					6, 750	7.50
Pears.....	80	Pound.....	474, 600	5, 900	.024	11, 200	140.00
Potatoes.....	135	Bushel....	10, 557	78	.84	8, 830	65.40
Wheat.....	1, 477	do.....	31, 000	21	1.78	55, 215	37.50
Tomatoes.....	105	Ton.....	738	7	13.00	9, 600	91.40
Straw.....	2, 902	do.....	3, 427	1.2	5.20	17, 880	6.15
Miscellaneous.....	304					12, 055	39.70
Less duplicated areas.....	7, 330						
Total cropped.....	11, 050	Total and average.....				619, 800	56.10
Irrigated, no crop:		Areas.			Acres.	Farms.	Per cent of project.
		Non-bearing orchard.....					
		Young alfalfa.....					
		Ground fall-plowed.....					
		Winter wheat.....					
		Less duplicated areas.....					
Total irrigated.....							
		Total irrigable area farms reported.....			18, 993	376	38.0
		Total irrigated (under rental contracts)...			12, 010	371	24.0
		Total cropped area farms reported.....			11, 050	371	22.1

crete work. The reconstruction of the Dry Creek flume on the Montrose and Delta system was completed.

A small dragline of three-eighths to one-half cubic yard capacity was received on December 13 from the Pawling & Harnischfeger Co., of Milwaukee. Thomas B. Hyde, master mechanic of the Grand Valley project, erected the machine and put it in operation on December 20. The dragline has been working steadily since that date excavating through seeped ground on the D E Lateral.

The crop census report was completed. The total crop value amounted to \$3,397,493, or about \$6,000 more than in the season of 1919. The unit prices received for nearly all crops were less than those of a year ago, but the larger yields and a small increase in acreage made the total value of the crop above that of a year ago.

Small quantities of water were carried in some of the canals for stock purposes.

At the close of the month a good snow blanket covered the upper portion of the project, giving a good covering for winter wheat. At the Delta end of the project the snow covering is rather light.

Labor was plentiful for all requirements of the project and farm.

A. H. Gullickson, chief accountant, was a visitor on the project from November 30 to December 1. Thomas B. Hyde, master mechanic of the Grand Valley project, was on the project from December 14 to 22.—*Porter J. Preston.*

BOISE PROJECT, IDAHO.

December weather was unusually mild and damp. The greater part of the precipitation was in the form of rain, although the ground was covered with a light fall of snow on several occasions.

Labor conditions.—A large number of men were thrown out of employment during the month. This was due to unfavorable weather conditions and general business depression. There has been little change in the wage scale as yet, but there will apparently be a general reduction in wages during the fore part of 1921.

Farming operations.—Work on the farms was light. In a few favored localities, where frost and moisture did not prevent, plowing was in progress. Winter feeding was carried on to a limited extent. Owing to the open weather the majority of the sheep owners held their flocks on the open range. The market for farm products except butter fat remained unfavorable. The railways announced a reduction in the freight rate for hay of \$5 per ton to Missouri River points. It is thought that this will aid the hay growers in disposing of their surplus at a price somewhat above the cost of production.

Water supply.—The flow of Boise River was about normal, averaging about 1,000 second-feet. The snowfall on the Boise River drainage basin is reported to be above normal for this season of the year and of high moisture content.

Operation and maintenance.—Water for filling Deer Flat Reservoir was carried through the Main Canal until the 13th, by which date the reservoir had been filled to half its capacity. Owing to stormy weather all maintenance work was suspended early in the month except minor repairs to structures, which were continued throughout the month with a small force.

Construction.—Although the weather was not severe, considerable time was lost on account of storms. Frost interfered to some extent, but the principal de-

lay was caused by frequent rains, which kept the ground thoroughly saturated. When weather conditions permitted, the contractors engaged on the excavation of the Notus Canal employed a large force of men and teams. Government forces installed the bridges and turnouts on the portions of canal that were completed.

Drainage.—The drainage work in the Riverside and Big Bend irrigation districts, which has been under way during the past two years, was nearly completed. Drag line No. 4 finished the Okander system the latter part of the month, and was then overhauled preparatory to placing it in the storage yard. Drag line No. 3 still has about a month's work to complete. It will probably take the entire month of January to finish the structures on the drainage system.

In the Nampa and Meridian district three additional relief wells were put down in the water-logged area south of Nampa.

Surveys.—The field work was confined to giving lines and grades for the construction and drainage work in progress, and for the extension of the lateral system under the constructed unit. Data were prepared for the replacement of timber structures that have decayed.—*J. B. Bond.*

KING HILL PROJECT, IDAHO.

The weather during December was as favorable for construction work as might be expected at this season of the year.

At Camp 4 excavation and grading of flume bench were completed on the 13th and pouring of concrete was finished on the 30th. A small amount of work on structure drainage and the outlet for siphon No. 1 remained to be done.

At Camp 7 the inlet of Big Pilgrim Siphon was completed December 15 and concreting Four Mile Flume and Wasteway No. 7 completed on the 16th.

At Camp 6 McEachern wood-stave flume was completed with exception of 100 linear feet of staves.

At Camp 8 contractor had completed 80 per cent of the excavation at inlet of Cassia Siphon. Backfill at inlet is completed. The outlet remains to be back-filled.

Camp 9 was closed December 29 on account of cold weather. Concrete work at this location was 60 per cent complete. Excavation was complete except for 800 linear feet of subgrade.

At Camp 10 concrete work at Tuanna Siphon was completed during December. Some of the forms are yet to be removed. Backfill of inlet and outlet is completed and camp was being dismantled December 31.

King Hill irrigation district had a force engaged in cleaning canals and repairing wooden structures.—*Walter Ward.*

MINIDOKA PROJECT, IDAHO.

Regular operation and maintenance work was at a standstill during December on the South Side pumping unit. Three miles of the C-2 transmission line to the Heyburn substation were rebuilt.

At America Falls six survey parties were still doing preliminary work on the American Falls Reservoir. At the end of the month 84 miles of primary and 192 miles of secondary levels had been run, 13,825 miles of topography taken, and 155 miles of fly-line run.

Two drill outfits were making wash borings on the dam site; total of 40 holes, with a total penetration of 2,212 feet.

One plane table party was making land classification within the reservoir, having classified 18,260 acres.

Purchase of right of way was being pushed, 65 offers by the United States for purchase of real estate had been made, aggregating approximately \$70,000.—*Barry Dibble.*

Prevailing crop prices at close of December, 1920.

Project.	Alfalfa hay, per ton.		Bar- ley, per bushel.	Oats, per bushel.	Wheat, per bushel.	Pota- toes, per bushel.
	In stack.	Baled at ship- ping point.				
Salt River.....	\$16-\$20	\$24-\$28				
Yuma.....	18.00	23.00				
Orland.....	20.00	25.00	\$0.55		\$1.35	
Grand Valley.....	12.00	16.00	1.50	\$0.75	1.25	\$0.60
Uncompahgre.....	8-12		1.50	.70	1.15	.60
Boise.....	7.00	12.50	.55	.65	1.20	.75
King Hill.....	9.00	13.50		.96		1.05
Minidoka.....						
Huntley.....	6.00	12.00				
Milk River.....	9.00	16.00	.35	.26	1.39	1.50
Sun River.....	14.00	19.00	.85	.70	1.37	.90
Lower Yellowstone.....	10.00	13.00	.75	.60	1.47	1.00
North Platte.....	7.00		.85	.45	1.43	.65
Newlands.....	14.00	18.00				1.20
Carlsbad.....		22.50				
Rio Grande.....	25.00				1.80	
North Dakota pumping.....	20.00			.53	1.46	1.25
Umatilla.....		13.00				
Klamath.....	14.00	25.00	.72	.64	1.50	1.80
Belle Fourche.....	7-8	13.50		.40	1.35	1.20
Strawberry Valley.....	20.00	25.00	1.38	1.00	1.65	.90
Okanogan.....	25.00	30.00				1.50
Yakima:						
Sunnyside unit.....	10.00	14.00				.65
Tieton unit.....	10.00	14.00				.65
Riverton.....	10.00			.80	1.05	.75
Shoshone.....	4-7	5-10	1.05	.70	1.15	.70
Indian projects:						
Blackfoot.....			.54	.43	1.39	
Flathead.....	15.00	20.00		.64	1.36	1.00
Fort Peck.....	15.00	20.00		.25	1.52	1.50

HUNTLEY PROJECT, MONTANA.

December weather was normal and would have permitted field operations for the entire month. The temperature was low between the 20th and 27th, the minimum of -22° occurring on the 23d.

All field work was suspended on December 4 except that which could be done by foremen and truck drivers, who were employed in gathering in equipment and materials from the field, and in general repair work and maintenance of equipment in the shop at Ballantine.

The crop statistics were compiled and completed, the average value per acre showing a decrease from \$49 in 1919 to \$27.11 in 1920.

The proposed supplemental construction charge voted on December 1 by the water users for new work and the method of refunding the operation and maintenance deficit was defeated, 161 voting for, 223 voting against, and 225 not voting. The work proposed was:

1. Structures: The replacement of deteriorated structures with others of permanent type. These consist of flumes, siphons, checks, drops, turnouts, etc.
2. Cleaning and deepening surface drains.
3. Construction of deep drains, both open and closed.
4. Replacement of closed drain trap boxes with others of permanent type.
5. Reconstruction of long reach of main canal near Osborn.

The amount of the increase would have been \$29.50 per acre of irrigable land on the project, payments to begin in 1935. Of the total amount so derived, \$423,487.04 would have been used to repay the excess cost of operation and maintenance over repayments made and contracted, and \$410,000 would have been expended in new work as stated above.

The general agricultural conditions in this section of Montana were very discouraging. Winter wheat was in poor condition, as extremely dry weather prevented it from getting a good start. There was practically no market for hay. Winter range conditions were exceptionally good and stock were in fine condition. Stockmen were discouraged over market and freight conditions and when able to do so were holding their stock.—*A. R. McGinness.*

MILK RIVER PROJECT, MONTANA.

Notwithstanding the fact that a minimum temperature of -32° was reached, December was unusually mild except for the period from the 20th to 27th. The maximum temperature was 54° , which was 6 degrees above normal, and the mean temperature was 21° , or 5 degrees above normal. About 3 inches of snow fell during the month, which was much appreciated by stockmen. However, at the end of the month, practically no snow was left on the ground. The precipitation at Malta for the year was 16.23 inches, or 3.6 inches above the mean; 7.2 inches of the year's rainfall, however, fell during a short interval in June, and was not well distributed for growing crops. Some blackleg was reported through the surrounding country, but preventive measures were promptly taken. The labor supply was ample.

Construction by contract.—Work was continued on the construction of the office building at the Saco operation and maintenance headquarters and commenced on a three-room cottage at Vandalia Dam. Good progress was made by five small earthwork contractors until the 20th.

Construction by Government forces.—Work was continued on the siphon for the NS-116-2-10 across Beaver Creek, about 6 miles west of Hinsdale, and at the end of the month this structure was practically completed to above ordinary high water. One concrete culvert was built.

Maintenance and operation.—Extensive repairs were made to three concrete wasteways and one flume. The protection of canal bed and banks below the lined section and the outlet works at Rocky Point, mile 8 of the Dodson South Canal, was nearly completed. The crop census was completed, showing a value of about \$339,000 on the Malta and Glasgow Divisions and about \$427,000 on the Chinook Division.—*Geo. E. Stratton.*

ST. MARY STORAGE UNIT.

December weather was moderate, with little precipitation, and was generally favorable for the work in progress, although high winds hindered the work at Sherburne Lakes Dam.

Construction work was confined to Sherburne Lakes Dam where the north hillside slide area was cleared of brush and trees, and a general cleanup about the damsite and camp was completed. Work at this point was discontinued on the 13th and the crews disbanded, the engineer in charge being transferred to the project office for work on the annual project history, etc. One foreman was also transferred to project headquarters for work in connection with the installation of an electric lighting system at the head-

quarters camp. No operation and maintenance work was done on the St. Mary Canal except caring for stock, hauling supplies and equipment, etc. From the 13th to the end of the month all field camps were in charge of caretakers.

One carpenter, assisted at times by a caretaker, braced bridges along the canal so they will hold the Bucyrus dragline when it is moved in the spring from the Canadian customs for work on the St. Mary Canal.—*R. M. Snell.*

SUN RIVER PROJECT, MONTANA.

December weather was unusually mild and pleasant with one cold snap from the 20th to 26th. Good progress has been made on Pishkun Reservoir and the ditches connecting depressions in the reservoir are about 60 per cent completed. In addition to completing these ditches dike No. 3 is to be faced with gravel and dike No. 4 is to be paved. A concrete turnout has been constructed in Greenfields Main Canal so as to turn water into Big Coulee for the irrigation of about 2,000 acres of land near Simms.

On the Fort Shaw division maintenance work consisted of hauling gravel and sand for concrete structures and compiling crop reports. No water was run in the canal system.

On the Greenfields division the only maintenance work done was the building of a sewer system for the two new cottages and the removal of equipment from Camp 14 to Fort Shaw and Fairfield. The new turnout gates recently purchased were also installed.

The project farmers were engaged in marketing products and clearing fields of weeds. Some plowing was done. There was little demand for farm products and prices continued low, wheat making the only advance over prices quoted at the first of the month. Three carloads of potatoes, 9 of wheat, 17 of hay, and 2 of flax were shipped from the project during the month.—*Geo. O. Sanford.*

LOWER YELLOWSTONE PROJECT, MONTANA—NORTH DAKOTA.

The ideal weather conditions that have prevailed throughout the autumn continued through December, with the exception of a few cold days from the 17th to the 24th. The precipitation, which was only 0.13 inch, was 23 per cent of the normal.

Dragline excavator No. 1 was closed down on the 4th, owing to the frozen condition of the material. Excavator No. 2 was closed down on the 14th, having completed the removal of silt below Thomas Point. Machine No. 3 completed the drain at the outlet of Nohle Lake on the 20th and was being moved to the Ridgellawn camp for winter storage.

After the closing down of excavators Nos. 1 and 2 the dragline runners were engaged at overhauling and repairing these machines for next year's operation and the best of the remainder of the crew were placed at work cutting the new growth of willows in the main canal.

The field work for collecting crop statistics was completed during the month.

The survey work in connection with lateral and main canal extensions was practically completed.

On December 10 the chairman of the board of commissioners and the president of the Lower Yellowstone Water Users' Association were authorized to sign the contract with the United States that has been under consideration for some time.—*L. H. Mitchell.*

NORTH PLATTE PROJECT, NEBRASKA-WYOMING.

The weather for December was unusually fine. No storms occurred until the 20th and the ground conditions were favorable for construction work. The mean temperature was 3.8° above the mean temperature for the month of December. The precipitation was 0.33 inch at Lake Minatare, Nebr., and 0.46 inch at Wyncote, Wyo.

Operation.—The Fort Laramie Canal was operated as far as mile 25.5 to furnish water for the Lingle power plant. Considerable difficulty was experienced owing to alternate freezing and thawing and the formation of slush ice. It was necessary to discontinue sluicing operations at the sand trap at mile 0.6 on account of the small amount of water available.

Maintenance.—The fall maintenance work was carried on unusually late on account of favorable weather, and a large amount of work was accomplished. After the storm on the 20th these forces were reduced to a minimum. Monighan drag line No. 4 continued the work of widening the Interstate Canal, operating with two shifts daily and excavating 25,780 cubic yards of material or 550 cubic yards per shift.

Crops.—There was little movement of crops and apparently little market. Prices were generally unsatisfactory to the farmers.

Live stock.—There was little activity along live stock lines, an unusually small amount of stock being fed on the project.

Drainage.—Monighan drag line No. 2 continued work on the Lower Nine Mile outlet drain, operating with three shifts daily and excavating 11,645 cubic yards of material or 332 cubic yards per shift. One highway bridge was completed over this drain. Drag line No. 3 continued work on the Dunham Andrews Drain, completing all of the branches and moving back to the main drain to clean silt and to convert the lower end of the drain from a closed to an open drain.

Tests of the Kelly well No. 1 on the Dutch Flats were continued. Pumping was discontinued on the 17th.

On the Fort Laramie unit, electric drag line No. 2 continued work on the Cherry Creek Drain, operating with two shifts daily and excavating 38,941 cubic yards of material or 846 cubic yards per shift. Piling were driven for a highway bridge at station 727 of this drain.

Construction.—Storage unit: Good progress was made on the excavation of the tunnel for the new outlets at the Pathfinder Dam. Three shifts daily were worked and the total excavation for the month was 100 cubic yards. A large amount of gravel has been hauled for the concrete work. The weather has been favorable for freighting and a large amount of material and supplies has been hauled from Casper to the dam.

Interstate unit: The addition to the machine shop at the Mitchell headquarters was completed ready for the installation of machinery.

Fort Laramie unit: Electric drag line No. 1 continued work on the East Springer Lateral, operating with two shifts daily, excavating 35,675 cubic yards of material, and completing 1.91 miles of lateral. Drag line No. 3 continued work on the Fort Laramie Canal, operating with two shifts daily, excavating 15,170 cubic yards of material, and completing 0.18 mile of canal. Drag line No. 5 continued work on the Fort Laramie Canal, operating with two shifts daily, excavating 45,725 cubic yards of material, and completing 0.89 mile of canal.

The powder crew drilled 2,940 linear feet of holes and used 8,000 pounds of T. N. T. in loosening classified material.

The construction forces at the Cherry Creek and Fairview camps working on canal and lateral structures continued work when weather conditions would permit and accomplished an unusual amount of construction work for a winter month.

A new Austin drag line was received and was being moved to begin work on the wasteway channel at the wasteway at mile 25.5 of the Fort Laramie Canal.

Northport district: Work on the fills on the Northport Canal with the elevating grader outfit operated by Government forces was continued as long as the weather conditions would permit. During the month 3,956 cubic yards of material were placed in fills. The construction forces continued work on lateral structures and on the concrete siphon under West Indian Creek for the Northport Canal. Good progress was made. Two contracts for lateral excavation were completed and good progress was made on the remaining three earthwork contracts.

Electric drag line No. 4 continued work on the excavation of the Northport Canal, operating with two shifts daily, excavating 33,360 cubic yards of material, and completing 0.77 mile of canal excavation. Power for operating the machine is obtained from the Bridgeport Power Co., and 18,115 kilowatt hours were used during the month.

Power system.—The Lingle power plant was operated continuously throughout the month with three shifts daily. In addition to the power used for construction purposes, 1,300 kilowatt hours were delivered to Lingle, Wyo., 33,700 kilowatt hours to Torrington, Wyo., 11,900 kilowatt hours to Morrill, Nebr., and 34,800 kilowatt hours to Mitchell, Nebr. The amount of power delivered to these towns has steadily increased.

Surveys.—The surveys for the location of the lateral system to furnish water for the Upper Cherry Creek Valley were completed. Work was continued on the irrigable area surveys for the land under the Springer Lateral system.—*H. C. Stetson.*

NEWLANDS PROJECT, NEVADA.

Moderate weather, favorable for project work, prevailed, especially during the latter part of December.

Judge L. N. French, counsel for the irrigation district organization, was in Fallon December 6 and 7.

Consulting Engineer D. C. Henny spent December 16 in Reno presenting testimony in the Truckee River water-right adjudication case. The project manager conferred with Mr. Henny in Reno on proposed Spanish Springs Valley storage and other matters.

A conference was held on the 27th between Attorney Roy Stoddard, President Edmund Dietz, and Secretary L. Van Voorhis for the irrigation district and the project manager for the completion of final arrangements in connection with the plan adopted by the board for the assessment of drainage benefits and for filing the same with the district court. The court will hold hearings and decide upon the ratification of the assessment plan during January, 1921.

The project manager in company with Mr. True Vencil, member of the board of directors of the Truckee-Carson Irrigation District, visited the Spanish Springs Valley Reservoir site from December 28 to 30 for the appraisal of property and improvements.

Construction.—Reconstruction of the lower bank of the Truckee Canal was continued between Hazen and Fernley, using one Monaghan dragline excavator.

Reconstruction of the R. Lateral, T system, over a length of about 4,000 feet, was completed, using Government forces.

Several minor timber structures, two turnouts, and two drops were installed in the Rabjohn Lateral, T system.

Surveys and investigations at the Spanish Springs Valley Reservoir site were practically completed at the end of December with the exception of a small amount of test-boring work remaining to be done at the dam site. Topography of the dam sites for the proposed King Reservoir site near Reno was also taken during December. The Reno office was discontinued at the end of December, and maps, estimates, etc., will be prepared in the Fallon office.

In the Fallon district, irrigable area surveys for placing new lands on the farm-unit plats were made during December, covering a total area of about 1,200 acres. Preliminary locations were made for several laterals.

Settlement.—During the month recommendation was made for placing 1,030 acres of irrigable public land and 900 acres of irrigable private land on the farm-unit plats.

Water supply and use.—Storage in Lahontan Reservoir amounted to 125,400 acre-feet at the end of December, with an increase of 24,500 acre-feet during the month. The surface of Lake Tahoe recorded a rise of 0.22 foot.

The Truckee Canal was operated for storage in Lahontan Reservoir and operation of the Lahontan power plant.

The outflow from Lake Tahoe, amounting to about 9,600 acre-feet, was for Truckee River power-plant operation.

Operation and maintenance.—Maintenance work consisted largely of riprapping banks of the T Line Canal near the Trolson Bend and removal of trees and willows from the various canals and laterals.—*John F. Richardson.*

CARLSBAD PROJECT, NEW MEXICO.

December weather was unusually pleasant for this time of the year. The total run-off of the Pecos River equalled 14,300 acre-feet, or an average of 233 second-feet per day. The maximum flow was 292 second-feet and the minimum 192 second-feet.

Operation and maintenance work included only the construction of one lateral headgate and eight weirs in the lateral system, the hauling of necessary materials for the above work, and some minor repair work on structures.

There was plenty of labor for all necessary work during the month, at approximately rates paid before the war period, \$2 per day, including increase of compensation, with an increasingly large number of men out of employment.

Shipments of alfalfa hay after the 1st of the month increased slightly over the previous month, prices averaging from \$20 to \$22.50 per ton, f. o. b. cars. The alfalfa seed crop for the most part was still being held. There was no demand for the product. Cotton picking was active throughout the month. There had been 5,521 bales ginned to the end of December. It is estimated that the crop was about 92 per cent ginned. On account of favorable weather conditions, it is believed that the later picking is of better grade than a month earlier. All field work and most of the office work in taking the crop census was completed at the end of the month. It was found that there was an abandonment principally in the cotton crop of something like 14 per cent owing to the rather uni-

versal attempt to raise cotton on Johnson grass land and the scarcity of labor at chopping time. The total area irrigated for the season amounted to 23,302 acres; acreage cropped, 21,294. The total value of crops was over \$1,000,000 less than last season. The average value per acre was \$44.69, as against \$106.04 for 1919. The collections for the month were very light, owing to the poor financial condition of the project. Leases involving an area of approximately 26,000 acres of the Pecos River survey project were renewed for a term of three years. Proposals were received for leasing about 4,300 acres at McMillan reservoir. A State-wide quarantine against cotton bollworm has been imposed upon the State of New Mexico. The restricted area, however, only includes Dona Ana County. A force of Government men from the Federal Horticultural Board was on the project almost continually during the month in search of evidences of pink bollworm on this project. None has been found to date.—*L. E. Foster.*

RIO GRANDE PROJECT, NEW MEXICO-TEXAS.

December weather was favorable for field work. There was little frost and no rain nor snow.

Water for irrigation purposes was run from the 1st to the 18th.

The canals are badly silted which will necessitate the removal of about 150,000 cubic yards of material to put them in shape for the coming season. Contracts for winter cleaning were being awarded, bids ranging from 23 to 28 cents per cubic yard, the work to be completed by March 1.

The crop data have been collected and compiled, showing some very interesting results. In the El Paso Valley there were 7,278 acres of alfalfa which produced 21,984 tons of hay at an average price of \$24.52 per ton, making a total of \$539,343. Also 1,554,115 pounds of cotton were produced. The total gross receipts from all units, including those not operated by the Reclamation Service, but receiving the benefit from the reservoir, were \$4,639,213.

During the present nonirrigation season the major construction efforts on the project are being directed toward the reconstruction, enlargement, and extension of the distributing system. Three of the Bucyrus draglines in the Mesilla Valley have been working on canal and lateral reconstruction and enlargement. Construction of the Montoya Siphon, crossing the Rio Grande, has begun. This will be a 3-foot 9-inch reinforced concrete pipe 450 feet long, carrying water from the West Side Canal extension to the Montoya unit. Advertisements were issued for 61,000 cubic yards of earthwork construction on the Cantuillo Canal which constitutes the lower end of the West Side Canal extension, and advertisements are out for 52,000 cubic yards of earthwork on reconstruction and enlargement of the Las Cruces Lateral and Armijo Branch. In the El Paso Valley one dragline was working on the enlargement of the Franklin Feeder Canal. Construction of the Franklin Canal headgates and the construction of the sand skimming weir, was begun during the month. Bids were received on 116,000 cubic yards of earthwork on the Salatrall Lateral reconstruction, enlargement, and extension. Contract for the latter was awarded to the Lee Moor Contracting Co. at 30 cents per cubic yard. With the present program of reconstruction and enlargement of the distribution system in progress, there is being undertaken considerably more of this class of work than has ever been undertaken during any previous season.

Drainage construction is progressing with the following dragline excavators in operation: Monighan

1-T, in Rincon Valley, Monighan 2-T on Del Rio Drain in Mesilla Valley, and two Bucyrus machines on the Playa and Fabens Drains in the El Paso Valley. Bids were opened on December 15 for the construction of 250,000 cubic yards of drainage earthwork excavation on schedule 2 of the Tornillo Drain. Two bids were received for this work, one from the Jennings Construction & Engineering Co., at 13 cents per cubic yard, and one from J. L. McWilliams at 12 cents per cubic yard.

All the canal and lateral cleaning in connection with the winter maintenance work is to be performed by contract. Advertisements have been issued for 50,000 cubic yards on 13 different laterals in the El Paso Valley and for 75,000 cubic yards on 16 different laterals in the Mesilla Valley. Low bids on the work in the El Paso Valley ranged from 23 to 31 cents per cubic yard. Bids will be received on the Mesilla work on January 10.

James Munn, engineer, cost and property section, arrived in El Paso on December 20 and spent four days on the project looking over the new construction work and visiting Elephant Butte Dam, where two days were spent in inspection of the sluicing operations on the spillway and the work on the embankment.

Irving Harris, of the firm of Cone & Harris, Los Angeles, Calif., has been employed by the Elephant Butte Irrigation District, El Paso County Water Improvement District No. 1, and the city of El Paso, acting jointly to prepare an estimate and report on the feasibility of obtaining power from Elephant Butte Dam for city and commercial purposes in El Paso and vicinity.

J. B. Lippincott, one of the earliest supervising engineers of the service, now engaged in consulting practice, visited the project on December 30.—*L. M. Lawson.*

NORTH DAKOTA PUMPING PROJECT.

December weather conditions were the best for many years, for the same month of the year, thus mitigating conditions for the farmers who are short of feed for stock.

The precipitation was only 0.25 inch, being a deficiency for the month of 0.50 inch, and making an accumulated deficiency for the year of 1.96 inches.

The principal maintenance work was on the boilers and the pumping barge. As much maintenance as possible was postponed because of present high costs of materials and labor.

There was an abundance of labor, but existing labor contracts keep the rates up to the highest war-period figure.

The power plant was operated for the commercial power contract; 121,850 kilowatt-hours of electrical energy were delivered to the city of Williston. This month, again, all previous monthly outputs were exceeded. The month's output was 6,463 kilowatt-hours more than the same month of last year.

A supplemental contract was made with the city of Williston providing for an increase of 1 cent per kilowatt-hour for all energy up to 100,000 kilowatt-hours per month, and one-fourth cent increase for energy over 100,000 kilowatt-hours.

One thousand and twenty-five tons of coal were mined.—*Wm. S. Arthur.*

UMATILLA PROJECT, OREGON.

An abnormal precipitation was recorded during December, the total being 1.71 inches as against a mean for the previous 12 years of 0.94 inch.

Farming operations were curtailed owing to weather and market conditions; 72 cars of baled and chopped alfalfa were shipped during the month and over 11 tons of extracted honey. A limited amount of development work was done.

Labor conditions were not difficult owing to the small amount of work in progress.

One hundred and eighty-six yards of concrete were placed in the A Canal, this work being discontinued on the 10th of the month. A small amount of enlargement was done on a short section where the canal was excavated in cement gravel.

Maintenance work on the East Side was limited to that done by one crew of 2 to 5 men grubbing and cutting willows on canal banks. On the West Side the greater part of the month was spent in sluicing on the main canal, from 2 to 4 men being employed.

The feed canal was operated throughout the month, diverting from 202 to 260 second-feet, of which from 10 to 39 second-feet and from 200 to 230 second-feet were delivered to the Echo mills and Cold Springs Reservoir, respectively. The normal flow was discharged by the Umatilla River until about the middle of the month, when warm winds and rains in the mountains caused the river to rise gradually until at the close of the month it was in high flood. At the close of the month the available storage at Cold Springs Reservoir totaled 32,750 acre-feet. This is the best record of storage for the fall and early winter run which has yet been had. The best previous record was for 1913, when there were 30,225 acre-feet of available storage on December 31.

The only small construction work done during the month was on supplemental construction district No. 34; 958 linear feet of 16-inch and 444 linear feet of 20-inch concrete pipe were laid. One canal turnout and 4 farm turnouts were constructed, and 54 cubic yards of sand and gravel (pit) were screened and hauled to the line.

On December 16, Mr. Edwards, of Edwards, Fyfe & Co., of Kennewick, Wash., called at the local office. Mr. Edwards was formerly an employee of the Reclamation Service on the Sunnyside project. R. B. Ste-

vens, manager of the Ridgeland Irrigation District of Ridgeland, Wash., visited the West Extension unit on December 18, inspecting sluicing operations being carried on at that time. H. L. Holgate, district counsel, visited the project on December 29 in connection with official business.—*H. M. Schilling.*

KLAMATH PROJECT, OREGON-CALIFORNIA.

The greater part of December was cloudy and there were 12 days on which precipitation occurred. At the end of the month most of the smaller streams were at flood stage. Water was flowing into Tule Lake at the rate of about 1,200 cubic feet per second.

Grain on a part of the project had not yet been thrashed. Thrashing was still in progress on the Tule Lake lands. The harvesting of all grain crops was very slow on account of wet weather.

Three small crews were engaged from the 1st to the 20th in general project maintenance work, principally in overhauling timber flumes.

The Monaghan excavator No. 122235 was engaged all month in the construction of drainage works for the Upper Van Brimmer Drainage District. During the month 12,300 cubic yards were excavated in this district.

A crew of about 17 men was engaged in moving camp from the lining job of the flume on the C Canal. Two carloads of lumber have been received and the construction of the forms for the present flume will be started at an early date.

On December 15 a hearing was held at the Klamath project office to consider whether the gates at Klamath Straits should be opened as desired by A. E. Bolton, representing the Churchill and other California interests, or be kept closed as provided in the contract between the United States and the Klamath Drainage District. Further evidence will be submitted, after which the entire question will be referred to the Secretary of the Interior.

H. L. Holgate visited the project from December 14 to 19. The project manager returned from Washington, D. C., on December 12.—*Herbert D. Newell.*

Crop report, Klamath project, Oregon-California, 1920.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	14,350	Ton.....	41,227	2.87	\$14.00	\$577,179	\$40.20
Hay.....	2,622	do.....	3,379	1.29	14.00	47,303	18.00
Wheat.....	2,736	Bushel....	44,494	16.3	1.71	76,080	27.80
Oats.....	2,449	do.....	45,848	18.7	.72	33,000	13.40
Barley.....	1,903	do.....	46,658	24.5	.84	39,200	20.60
Rye.....	1,185	do.....	11,850	10.0	1.26	14,930	12.60
Potatoes.....	201	do.....	27,070	135.0	1.80	48,720	242.40
Garden.....	64	Acres.....			150.00	9,600	150.00
Pasture.....	9,750	do.....			6.00	58,500	6.00
Total cropped.....	35,260		Total and average.....			904,500	25.65
		Areas.	Acres.	Farms.	Per cent of project.		
Not cropped.....	2,840	Total irrigable area farms reported.....	42,156	416	90		
Grand total irrigated.....	38,100	Total irrigated area farms reported.....	38,100		90		
		Under water right applications.....	38,100		90		
		Total cropped area farms reported.....	35,260		83		

Project weather during December, 1920.

Project.	Station.	Temperature, °F.			Precipitation (inches).
		Maximum.	Minimum.	Mean.	
Salt River.....	Phoenix, Ariz.....	75	28	49.7	T.
Yuma.....	Yuma, Ariz.....	71	32	52.4	T.
Orland.....	Orland, Calif.....	60	32	44.2	4.48
Grand Valley.....	Grand Junction, Colo.....	47	0	26.2	.38
Uncompahgre.....	Montrose, Colo.....	52	-6	24.4	.91
Boise.....	Boise, Idaho.....	54	16	34.2	2.39
King Hill.....	Glenns Ferry, Idaho.....	54	14	38	1.35
Minidoka.....	Burley, Idaho.....	46	7	29.3	1.00
Huntley.....	Ballantine, Mont.....	47	-22	21.8	.44
Milk River.....	Malta, Mont.....	54	-32	21.1	.17
St. Marys storage.....	Near Babb, Mont.....	56	-15	26	.12
Sun River.....	Fort Shaw, Mont.....	56	-16	29.6	.07
Lower Yellowstone.....	Savage, Mont.....	52	-22	20.7	.13
North Platte.....	Wynote, Wyo.....	63	-27	28	.46
Newlands.....	Fallon, Nev.....	60	9	.....	.26
Carlsbad.....	Carlsbad, N. Mex.....	73	10	42.7	T.
Rio Grande.....	El Paso, Tex.....	71	19	43.4	T.
North Dakota pumping.....	Williston, N. Dak.....	49	-19	17	.25
Umatilla.....	Hermiston, Oreg.....	60	15	36.9	1.93
Klamath.....	Klamath Falls, Oreg.....	43	12	30	2.58
Belle Fourche.....	Orman, S. Dak.....	56	-24	25	.29
Strawberry Valley.....	Provo, Utah.....	50	-1	28.5	1.89
Okanogan.....	Omak, Wash.....	44	2	30.1	1.84
Yakima:					
Sunnyside unit.....	Sunnyside, Wash.....	62	18	35.4	.95
Tieton unit.....	Cowiche, Wash.....	50	19	32	1.72
Riverton.....	Diversion dam, Wyo.....	50	-20	20.5	.15
Shoshone.....	Powell, Wyo.....	51	-5	22.8	.20
Indian projects:					
Blackfeet.....	Browning, Mont.....	44	-10	20.5	T.
Flathead.....	St. Ignatius, Mont.....	52	9	31	.25
Fort Peck.....	Poplar, Mont.....	52	-24	17.9	.05

BELLE FOURCHE PROJECT, SOUTH DAKOTA.

December weather was favorable for outdoor work. Little precipitation occurred, and roads in general were good. One week of cold weather beginning on the 20th was rather pronounced, but on account of the absence of wind was not unusually severe. On the 18th, 21st, and 26th light snows occurred, the deepest being 3 inches. The total precipitation amounted to only 0.3 inch. The total flow of the Belle Fourche River was 9,945 acre-feet, of which 9,686 acre-feet were delivered to the reservoir, making a total storage at the end of the month of 153,400 acre-feet.

Owing to the approach of winter little maintenance work was done. A small crew of men worked out of Newell, and made repairs to the Dry Creek Flume and certain minor structures. From Vale Camp a crew averaging 10 men was engaged during the first 20 days of the month repairing flumes on the Indian Creek Lateral. The substructure of one 25-second-foot capacity flume, 150 feet long, was worked over and largely rebuilt. Sixty yards of gravel were hauled for replacing the wooden chute on the Vale Lateral with concrete. Twenty-five yards were hauled for repair work on Experimental Farm Siphon and Dry Creek Wasteway. Gravel was also hauled by the Orman crew for the placing of new bottom slabs in four concrete culverts under the South Canal.

Labor was plentiful, although the demand was light.

The only movement in crops was the baling and marketing of alfalfa hay at \$14 per ton f. o. b. cars. This price was reduced toward the latter part of the month to \$13.50 per ton, leaving the farmers a net return considerably below the cost of production.

Mr. Towle was engaged throughout the month in the office, compiling data and making studies prepar-

tory to getting out advertisements and proposals for earthwork and structure contracts on Willow Creek Lateral extension. It is anticipated that contracts for the construction of the Willow Creek unit will be let in time for work to commence early in the season.

Live stock on the project were in good condition. Only a small percentage of range stock was being wintered on the project as compared to former years. This is due partly to the fact that native hay on the range was exceptionally good this year, and partly to the depleted condition of range herds. The depletion of range herds has been caused largely by the forced sale of cattle and sheep to meet obligations of stockmen at the banks. A number of cases have been reported where sheep shipped to Omaha did not sell for enough to pay the freight. Cattle not in prime condition met with almost as bad results.—B. E. Hayden.

STRAWBERRY VALLEY PROJECT, UTAH.

December was generally stormy with average snowfall and temperature.

Farming operations.—Farming operations practically ceased owing to extremely cold weather. Harvesting of the beet crop was finished on the 10th and farm work resolved itself into the usual winter routine of stock feeding.

Labor conditions.—The labor situation reversed itself during the month; instead of a shortage, there was an ample supply of all classes of labor.

Operation and maintenance, storage system.—Work on repairs to Strawberry Tunnel progressed satisfactorily. The new 50 horsepower fuel engine was started on the 20th and the crushing plant on the 22d. About 1,000 linear feet of tunnel floor were reconcreted and 2,000 linear feet of tunnel cleaned and made ready for concreting. Freighting operations ceased and two shifts were organized to prosecute work as rapidly as conditions will permit. Camp facilities are now adequate for the maintenance of 43 men throughout the winter.

Hydroelectric power plant operation.—The power plant was operated without serious interruption throughout the month and power furnished to the towns of Spanish Fork, Salem, Payson, and Springville. Exciter turbine repair parts were ordered through the Denver office and advertisements issued for their manufacture and purchase. The crest of the Spanish Fork Diversion Dam was evened up and temporary provision made for raising the crest by means of flash boards.

The telephone and transmission lines were operated without trouble.

Settlement.—No water-right applications were received during the month. Most of the Government farm units in the project are applying for patent during the coming year.

General.—Leases between the United States and the Strawberry High Line Canal Co., covering the rental of the Strawberry Valley grazing lands, were approved by the Acting Director on the 20th.

Water users under the Lake Shore and Spanish Fork units held a meeting at Spanish Fork City on the 20th and took preliminary steps toward the formation of some form of corporate organization whereby they may be enabled to deal with the United States in matters relative to the taking over of the project by the water users.

The drainage district along Payson Slough and Beer Creek was approved by the county commissioners and will be known as District No. 4.

The Santaquin irrigation district is awaiting final water allotment by the State engineer.—*W. L. Whittemore.*

OKANOGAN PROJECT, WASHINGTON.

December was practically normal as to precipitation, there being recorded 1.64 inches at Omak and 1.88 inches at Conconully.

The building of the machine shop was completed at the end of the month and only one carpenter was being employed on hanging doors and building cupboards for stock and machine tools. The mechanics have been employed in overhauling automobiles and the project truck and installing machinery in the machine shop. The two men employed on structural work on the distribution system were so employed until about the middle of the month, when conditions were such that additional structural work was not profitable; they were employed during the rest of the month for the greater part in surfacing roads around project headquarters and assisting in placing the machinery in machine shop.

The inflow into Conconully Reservoir for the month amounted to 364 acre-feet, which is about normal for the month. Twenty and one-half inches of snowfall were recorded at Conconully, with 12½ inches of solid snow remaining on the ground at the end of the month. There have been reported, at an elevation of 4,000 feet in the watershed, 4 feet of snow, which is equal to the snowfall at this time in years when the water supply has been ample.

There was little movement of the apple crop, as prices were low, and crop was still being held in storage for possible advance in prices later.

Assistant district counsel, D. C. Tyree, visited the project during the month. Mr. Tyree gave most of his time to matters in connection with the purchase of sandy land water-right equities.—*Calvin Casteel.*

YAKIMA PROJECT, WASHINGTON.

The prevailing temperature during December was somewhat above normal, with heavy snowfall. A "chinook" occurred on the 30th, accompanied by rainfall at the storage reservoirs, which turned to snow on the 31st, when the temperature went down considerably.

The depth of snow at the reservoirs at the close of the month was as follows: Keechelus, 29 inches; Kachess, 23 inches; Cle Elum, 10 inches; Bumping Lake, 35 inches.

Operation and maintenance, Sunnyside unit.—Maintenance work consisted of placing gravel riprap on main canal banks, which was continued until the 20th of the month, the season's program being 80 per cent completed on that date. One maintenance crew was employed on replacement of wooden turnout structures with concrete, 14 structures being replaced on the main canal between the headgates and Zillah. Drilling of a well for domestic water supply was completed at 60-mile patrol house and work started on one at 51-mile.

Tieton unit.—On the main canal, placing of plaster lining was completed in Tieton Tunnel, and 50 per cent completed in North Fork Tunnel. Maintenance work on the distribution system consisted of repairs to small pipe lines, turnout gates, etc. Contractor F. C. Howard completed the construction of two 5-room cottages at Tieton headquarters.

Investigation and surveys for new units.—Location of the Moxee unit main canal was completed on the 21st, progress for the month being 18 miles of the total length of 55 miles. Location survey on the Roza unit main canal was resumed on the 22d. Test pits were dug on the Roza main canal, progress being 15 miles of the line in the Moxee Valley. Reconnaissance survey of irrigable area under the Roza and Moxee units in the Moxee and East Selah valleys was completed, comprising about 35,000 acres.

Crop report, Okanogan project, Washington, 1920.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	594	Ton.....	726½	1.22	\$26.00	\$19,180	\$32.29
Apples.....	4,164	Pound.....	17,931,648	4,306½	.02	358,630	86.13
Corn fodder.....	34	Ton.....	54	1.59	12.00	650	19.00
Small fruit.....	30	Pound.....	210,000	7,000	.05	10,530	345.16
Garden.....	81	Acre.....	108	1.02	30.00	14,380	177.47
Hay.....	106	Ton.....	108	1.02	30.00	3,240	30.57
Pasture.....	254	Acre.....	88,315	6,277½	10.00	2,540	10.00
Peaches.....	14	Pound.....	285,300	6,038.1	.04	3,450	251.10
Pears.....	47	do.....	7,960	796	.06	480	47.76
Prunes.....	10	do.....	223,800	9,325	.03	6,710	279.75
Potatoes.....	24	do.....					
Less duplicated areas.....	438						
Total cropped.....	4,920		Total and average.....			431,200	87.67
			Areas.		Acres.	Farms.	Per cent of project.
Irrigated, no crop:			Total irrigable area farms reported.....		6,418½	390	84.5
Nonbearing orchard.....		380	Total irrigated area farms reported.....		5,440	390	71.6
Miscellaneous.....		140	Under water right applications.....		4,059	350	53.4
			Vested water rights.....		1,381	40	18.2
Grand total irrigated.....		5,440	Total cropped area farms reported.....		4,920	390	64.8

Miscellaneous.—Extension of time on the withdrawal of waters of the Yakima River watershed for appropriation by the United States Reclamation Service, for a period of three years to and including December 31, 1923, was granted by the State hydraulic engineer of Washington on December 9, 1920. The annual crop report shows a return on the Sunnyside unit alone, for the year 1920, of \$8,330,394, an average of \$105.53 per acre on a total area cropped of 78,936 acres. (Total area irrigated was 93,610 acres.) Project Manager J. L. Lytel, Engineer C. E. Crownover, Assistant Project Manager J. G. Heinz, and Superintendent of Irrigation J. S. Moore attended the Washington Irrigation Institute held at Ellensburg on December 16 and 17.—*J. L. Lytel.*

RIVERTON PROJECT, WYOMING.

The temperature during December was about normal. The precipitation of 0.15 inch fell as snow. A high wind drifted the snow on December 19, making the roads impassable for a few days. At the end of the month the roads were in good condition for hauling.

Drag line No. 23 was operated two shifts the entire month. Drag line No. 22 was operated two shifts from December 1 to 7, when a fire destroyed the cab, Delco lighting system, and compressor tank, making it necessary to give the operating machine a general overhauling. Operation was again commenced on December 30. The total amount of excavation on the Wyoming Canal for the month was 14,390 cubic yards, of which 3,250 cubic yards were excavated from outside the canal prism. Of the total excavation 10,010 cubic yards were class 1 material, being a heavy gravel, and 1,130 cubic yards class 2, being hard shale.

Project Manager Comstock was absent from the office from December 16 to the end of the month on account of sickness.—*G. H. Baird.*

SHOSHONE PROJECT, WYOMING.

December was an unusually pleasant month. Mild temperatures prevailed and there was little precipitation. It was well suited to all manners of seasonable outdoor work.

Water supply.—The lowering of Shoshone Reservoir by means of the balanced valve control continued from the 1st to the 10th. On the latter date the valves were closed in order to cut down the stream flow, so that test borings could be carried on at the Willwood Dam site.

Operation and maintenance.—Practically no maintenance work was in progress during the month, the principal item being the pumping out of siphons. In the office the advanced crop report was completed.

Crops.—The marketing of crops during the month was slow, owing to unfavorable market conditions. The principal shipments from the project consisted of 83 cars of alfalfa hay, 52 of alfalfa meal, 5 of wheat, 4 of potatoes, and 1 of clover seed.

Labor.—The labor situation was satisfactory.

Drainage.—Drainage construction ceased during the month. Depending on the character of the material and the nature of the machine, shutdowns became necessary from the 4th to 29th. On the Garland Division three drag lines and the Austin trencher were employed up to the time of the shutdown. The Bucyrus drag line excavated 4,190 linear feet of open drain 28. The Monighan drag line excavated 1,080 linear feet of open drain 28-28. The Lidgerwood drag line excavated 195 linear feet of open drain X-92. The Austin trencher machine excavated 1,950 linear

feet of closed drain C-1. On the Frannie Division the Bucyrus drag line excavated 1,050 linear feet of drain D-102. A new P. & H. drag line, one-half cubic yard capacity, was received at Cowley. It was unloaded and assembled, but will not be placed in operation until next season, when it will be placed on Sage Creek Channel rectification work near Cowley Station. The enlargement of the machine shop at Powell was practically completed during the month. The principal new equipment installed consists of a lathe, a shaper, larger forges, a rip saw for woodwork, and a lighting system for the entire shop.

Field and office engineering.—Field work was carried on by two crews each on the Garland and Frannie Divisions. Two crews were engaged on work connected with construction and drainage work in progress. One crew on the Frannie Division was engaged on miscellaneous surveys and one crew on the Garland Division was engaged on the topographic surveys for drainage and the Willwood Diversion Dam site and the upper reach of the Willwood Canal. In the office the principal work consisted of the completion of a set of maps and applications for new permits and applications for explanatory statements of existing permits in connection with the project's water rights under the State law. The office building at Deaver was partially destroyed by a fire on the morning of the 29th. The main damage was to the building. No valuable records and little valuable equipment were lost.

Construction.—Owing to the favorable weather, timber construction on the Frannie Division progressed satisfactorily; 155 minor structures, involving about 80,000 f. b. m. of creosoted lumber, were erected. These structures are on the lateral system of the third unit. A few timber structures were also erected in connection with the waste water recapturing system. This work was done by the operation and maintenance forces. The various earthwork contractors made fair progress, excavating 4,700 cubic yards of material.

At Shoshone Dam the camp buildings and the housing for the construction plant were completed. The construction plant is nearly all assembled, and it is expected to begin excavation at the power-house site early in January. Attempt was made to pull the trash rack at the head of the 42-inch blow-off pipe, but this was unsuccessful, as the trash racks could not be moved with the application of all the load that the cableway permitted. It is now proposed to secure additional power by the use of a pontoon, the construction of which was begun at the close of the month.—*J. S. Longwell.*

INDIAN PROJECTS, MONTANA.

BLACKFEET PROJECT.

Clear and moderate weather prevailed during December, with an absence of precipitation and only occasional high winds.

No construction work was undertaken, and maintenance work was confined to minor miscellaneous repairs to small structures, cleaning up around camps, and making general preparations for winter.

At the close of the month all field work had been discontinued and all field crews disbanded for the season. Work in the project office was confined to work in connection with farm unit plats, collection of first installment on repayment of construction cost, preparation of annual history and operation and maintenance reports, miscellaneous estimates, and routine work.—*R. M. Snell.*

FLATHEAD PROJECT.

At Dry Fork Dam earth fill amounted to about 10,000 cubic yards, which practically completes work under this item. About 1,200 cubic yards of riprap were placed during December. Gravel hauling for paving was temporarily discontinued because the teams were needed for hauling the grader. The cast-iron service gate and hoist were installed in the outlet tower.

At Dry Creek, lining, clearing, and grubbing were in progress from station 252+00 to station 190+00, a distance of 6,200 feet. Excavation amounted to 5,846 cubic yards, of which 4,317 were class 1, 1,298 class 2, and 231 class 3. This work was done between stations 265+00 and 204+00.

At Pablo Feed Canal enlargement was in progress between stations 1225+00 and 1200+00 and stations 1254+00 and 1286+00, a total distance of 3,700 feet, involving 10,373 cubic yards of excavation, of which 7,673 was class 1, 2,500 class 2, and 200 class 3. At Dry Creek headworks 23.8 cubic yards of reinforced concrete were placed. Work on this structure was discontinued on December 8 on account of cold weather.

All construction was by Government forces.

Plowing and seedling were completed during the early part of the month. There was a surplus of hay owing to the continued mild weather and the price was low. At the close of the month a critical condition existed for winter wheat, because of moisture in the soil and the absence of snow.

The condition of the live stock continued excellent and the past year has been one of the most successful in this respect in the history of the project.—*E. A. Moritz.*

Summary of employees for December, 1920.

Projects.	Begin- ning of month.	End of month.	Increase.	Decrease.
Yuma.....	149	159	10	
Orland.....	87	120	33	
Grand Valley.....	138	80		58
Uncompahgre.....	164	72		92
Boise.....	454	108		346
Minidoka.....	125	90		35
Huntley.....	59	12		47
King Hill.....		61	(No report.)	
Milk River.....	93	55		38
St. Mary storage.....	31	4		27
Sun River.....	61	56		5
Lower Yellowstone.....	28	24		2
North Platte.....	482	473		9
Newlands.....	67	67		
Carlsbad.....	15	17	2	
Rio Grande.....	648	591		57
North Dakota pumping.....	33	33		
Umatilla.....	35	30		5
Klamath.....	77	57		20
Strawberry Valley.....	71	66		5
Belle Fourche.....	41	18		23
Okanogan.....	102	67		35
Yakima.....	151	127		24
Riverton.....	39	37		2
Shoshone.....	251	181		70
Denver office.....	84	85	1	
Blackfeet.....	11	19	8	
Flathead.....	154	150		4
Fort Peck.....	10	11	1	
Field legal offices.....	23	24	1	
Washington office.....	92	92		
Unassigned per diem.....	35	35		
Examiners' force.....	2	2		
Total employees.....	3,812	3,023		
Increase.....			55	
Decrease.....				905
Net decrease.....				850

FORT PECK PROJECT.

The temperature for December was about 2 degrees above normal. There was very little snowfall and the range was in good condition. The precipitation was 0.05 of an inch, making 9.31 inches for the year, which is 4 inches below the average.

No construction work was done during the month. One car of steel was received and hauled to Poplar River camp, and gravel was hauled for the siphon on Poplar River when the weather would permit.

On December 15 the Northern Montana Development Association passed a resolution indorsing the Fort Peck project and advocating the early construction of the Poplar River Storage Dam to furnish a reliable supply of water for this unit.—*R. M. Conner.*

GENERAL OFFICES.

Washington office.—Director Davis returned on December 12 from his trip in connection with the preparation of the report under the Kinkaid Act of the Lower Colorado River development, and the possibilities of irrigation in the Imperial Valley, Calif. The report was transmitted to Congress on December 6. On December 14 he appeared before the House Committee on Appropriations at a hearing on the proposed appropriations for the work of the Reclamation Service during the fiscal year 1922. On December 29 the committee reported the sundry civil bill, carrying an appropriation of \$20,288,000 for the work of the service, including \$400,000 for the new Deschutes project and \$100,000 for secondary projects.

During the absence of the director the office was in charge of Assistant Director Morris Bien as acting director.

The chief counsel was in the office during the entire month.

On December 2 a hearing was held before the Secretary on the contract with the California-Oregon Power Co.

On December 13 a letter was prepared for the Secretary's signature to the President, submitting a supplementary estimate of \$400,000 for beginning work on the Deschutes project, Oreg. This was approved by the President, and on December 14 a letter was prepared for the Secretary's signature to the Secretary of the Treasury, transmitting the estimate as above.

On December 18 a letter was prepared for the Secretary's signature, reporting favorably on bill H. R. 14955 to amend section 2 of the act of August 9, 1912, so that in case an entryman to whom patent has issued prior to full payment of construction charges, fails to make payment of any subsequent charge when due, title would not revert to the United States until one year after the default; signed December 22.

On December 18 a letter was sent to the Secretary, transmitting for approval draft of contract with the El Paso County Water Improvement District No. 1, Rio Grande project, for the advancement of funds by the district to the Reclamation Service to a maximum amount of \$125,000 for carrying on drainage construction work in the Tornillo district; approved December 21.

On December 18 a letter was prepared for the Secretary's signature, reporting, without recommendation, on bill S. 4598 to provide funds for reimbursing farms on the Yuma project and to provide funds to operate and maintain the Colorado River front work and levee system of the Yuma project, such reimbursement and funds to be paid from the general funds of the Treasury; signed December 22.

On December 23 a letter was sent to the Secretary, recommending approval of draft of contract with the Okanogan Valley Power Co., by which the company would furnish electric power to the pumping plant at 33,000 volts, the United States to install and maintain the necessary transforming station to reduce the voltage to 6,600 volts; the estimated total disbursement, if the contract remains in force three years, approximating \$17,000 in addition to \$6,000 for the cost of the transformer plant; approved December 24.

During the month 1,428 inquiries from ex-service men concerning opportunities on the land were received and answered. Up to the end of the month a total of 178,994 such inquiries had been received.

The accompanying statement of fund transactions shows that the balance which should be in the Treasury at the end of the month is nearly twice as large as at the beginning of the month and that the deposits by the fiscal agents are much larger. It is also expected that approximately \$200,000 of oil funds will be deposited to the credit of the Reclamation Fund during January. In addition, definite advice has been received that approximately \$200,000 more will be made available soon, but beyond this amount no reliable estimate can be made as to when further funds will be credited to the Reclamation Fund.

Fund transactions, U. S. Reclamation Service.

[Taken from Washington Office books for the month of December, 1920.]

Treasury balance from Nov. 30 report-----	\$473,758.28
From:	
Land Office (October sales)-----	249,340.52
Deposits by fiscal agents-----	886,203.68
Collected by auditor-----	12,270.04
Increase compensation advanced-----	26,800.00
Total credit-----	1,648,372.52
Withdrawals:	
Requisitions for advances, Reclamation Fund-----	591,000.00
Requisitions for advances, increase compensation-----	26,800.00
Auditor's settlements-----	51,246.50
Total withdrawals-----	669,046.50
Balance-----	979,326.02
Land sales for November, placed in January--	273,316.78
Funds in hands of fiscal agents-----	421,778.23
Past production oil lease funds, available in January-----	810,362.11
Estimated net December land sales, available in February-----	125,000.00
	2,609,783.14

Schedule of balances in the below-listed appropriations, as shown on the books of the U. S. Treasury, January 10, 1921.

Reclamation Fund-----	\$422,000
Less requisitions issued but not charged-----	199,000
	233,000
Yuma Auxiliary fund-----	297,700
Riverton, Indian-----	16,800
Flathead, Indian-----	11,400
Fort Peck, Indian-----	48,000
Blackfeet, Indian-----	19,600

Among the visitors during the month were A. L. Behneman, of the Joshua Hendy Iron Works; Charles E. MacLean, of the Emmett irrigation district, Idaho; Hunter Macdonald, chief engineer of the Nashville, Chattanooga & St. Louis Railroad, the Tennessee Central, and the Birmingham and Northwestern Rail-

road; Dr. Flavio T. Riveiro de Castro, engineer under the Brazilian Government; Prof. Gardner S. Williams, Ann Arbor, Mich.; Dr. Elwood Mead; D. W. Hays, project engineer of one of the large irrigation projects in Canada; and Col. Jim Shelly, United States Army. During the month the members of Engineering Council, headed by Dr. J. Park Channing, chairman, visited the office to pay their respects to Director Davis, who is the president of the American Society of Civil Engineers.

Denver office.—The chief engineer returned to Denver on December 10 after visiting the Yuma project and taking a trip down the Colorado River from St. Thomas, Nev., to Needles, Calif., in connection with the Boulder Canyon investigations. Assistant Chief Engineers R. F. Walter and C. P. Williams were in the Denver office the entire month. Official visitors included Messrs. J. R. Alexander, A. H. Gullickson, H. N. Bickel, C. T. Pease, D. C. Henny, Joe Markham, George L. Hoffman, William M. Green, H. E. Fair, W. J. Egleston, Andrew Weiss, Leigh Cairns, and A. B. Fullerton.

In the designing division alternative designs were prepared for main-canal conduits, Hillcrest unit, Boise project. Work was begun on the preliminary design and estimate for the Guernsey Reservoir, North Platte project. Designs for a wasteway at the B Lift pumping plant, Yuma Auxiliary project, were completed. Studies were made of various types of arch dams for the Colorado River Storage secondary project, and a preliminary design and estimate of the Dewey Reservoir in the Colorado River Basin was partially completed. Preliminary estimates and designs were prepared for various structures on the Castle Peak secondary project, and for two alternative diversion sites from the Rio Grande River on the Lower Rio Grande secondary project. Numerous designs were prepared for the various projects covering lateral siphons, drops, division boxes, flumes, culverts, drain inlets, checks, bridges, and turnouts. Work was continued on the standardization drawings for control section type of chute drops for turnout radial canal and cast-iron gates and hoists.

The principal work accomplished in the electrical department consisted of studies relative to capacity increases in the South Side pumping plant of the Minidoka project; of revision of estimates for the Hillcrest pumping plant, Boise project; of preliminary valuations of power plants on the Truckee River, Newlands project; of studies and estimates for power plant at the Guernsey Dam, and of the commercial power possibilities of the Guernsey and Lingle plants on the North Platte project; of studies relative to the development of power at McLaughlin Canyon, Okanogan project; of tunnel design for Shoshone Dam, Shoshone project; of repairs to the balanced valves at Elephant Butte Dam, Rio Grande project; and of the preparation of estimates of the cost of power and pumping systems on the San Carlos pumping project.

In the legal department consideration was given to a revised plan for the execution and approval of contracts, and studies have been made relative to the preparation of regulations for leasing lands.

An average of 425 pieces of mail per day was received during the month; 1,110 disbursement vouchers were paid, amounting to \$335,790. Advertisements to the number of 359 were issued by the purchasing department, and 533 vouchers were prepared, involving a net expenditure of \$180,125. Transfers amounting to \$3,936 were effected between the various projects.—*F. E. Weymouth.*

ADMINISTRATIVE ORGANIZATION.

DEPARTMENT OF THE INTERIOR.

Hon. JOHN BARTON PAYNE, Secretary of the Interior.
 ALEXANDER T. VOGELSANG, First Assistant Secretary.
 SELDEN G. HOPKINS, Assistant Secretary.
 CHARLES D. MAHAFFIE, Solicitor for the Interior Department.
 CHARLES W. NESTLER, Assistant to the Secretary.
 JOHN HARVEY, Chief Clerk to the Superintendent of Buildings.

U. S. RECLAMATION SERVICE.

WASHINGTON OFFICE.

Arthur Powell Davis, director; Morris Bien, assistant director; Ottamar Hamel, chief counsel; J. B. Beadle, director's assistant; C. J. Blanchard, statistician; Hugh A. Brown, editor; C. A. Bissell, engineer; A. H. Gullickson, chief accountant; Miss H. A. Fellows and Raymond Depue, fiscal agents; C. H. Fitch, chief clerk; Emmet Carr, purchasing agent; G. W. Numbers, appointment clerk; H. N. Nickel, Yakima, Wash., and W. A. Meyer, Denver, Colo., examiners of accounts.

DENVER OFFICE.

F. E. Weymouth, chief engineer, Tramway Building, Denver, Colo.; R. F. Walter and C. P. Williams, assistant chief engineers; Miss L. H. Meisel, secretary to the chief engineer; J. M. Gaylord, electrical engineer; J. L. Savage, designing engineer; James Munn, consulting engineer; J. L. Burkholder, drainage engineer; L. J. Foster, office engineer; M. L. Luney, chief clerk; A. McD. Brooks, purchasing agent; Harry Caden, special fiscal agent.

FIELD LEGAL OFFICES.

Boise, Idaho.—B. E. Stoutemyer, district counsel. Projects: Boise, Minidoka, King Hill, and Jackson Lake Enlargement; R. M. Patrick, district counsel located at Burley, Idaho.

Denver, Colo.—Law section office of chief engineer: S. E. Roddis and Armand Offutt, district counsel; J. J. Luck, assistant district counsel.

El Paso, Tex.—P. W. Dent, district counsel. Projects: Rio Grande, Carlsbad, and Hondo.

Helena, Mont.—W. J. Egleston, district counsel, Helena, Mont. Projects: Blackfeet, Flathead, Fort Peck, Huntley, Milk River, St. Mary Storage, Sun River, North Dakota Pumping, Lower Yellowstone, and Shoshone.

Mitchell, Nebr.—J. N. Beardslee, district counsel. Projects: North Platte and Belle Fourche.

Montrose, Colo.—J. R. Alexander, district counsel. Projects: Grand Valley, Uncompahgre Valley, and Strawberry Valley.

Portland, Oreg.—H. L. Holgate and D. G. Tyree, district counsel. Projects: Yakima, Okanogan, Umatilla, and Klamath.

San Francisco, Calif.—Henry A. Cox and A. B. Fullerton, district counsel, 349 Pacific Building. Projects: Salt River, Yuma, Orland, and Newlands.

PROJECT ORGANIZATION.

Belle Fourche Project.—B. E. Hayden, project manager, Newell, S. Dak.; R. C. Walber, chief clerk; August Lewin, fiscal agent.

Boise Project.—J. B. Bond, project manager, Boise, Idaho; E. R. Mills, chief clerk; C. F. Weinkauff, fiscal agent.

Carlsbad Project.—L. E. Foster, project manager, Carlsbad, N. Mex.; V. L. Minter, chief clerk and fiscal agent.

Grand Valley Project.—S. O. Harper, project manager, Grand Junction, Colo.; A. W. Walker, engineer; G. H. Murphy, chief clerk; A. H. Hall, fiscal agent.

Huntley Project.—W. M. Green, project manager, Balantyne, Mont.; G. H. Bolt, chief clerk and fiscal agent.

King Hill Project.—Walter Ward, project manager, King Hill, Idaho; T. W. Hause, chief clerk; L. D. Eakin, fiscal agent.

Klamath Project.—H. D. Newell, project manager, Klamath Falls, Oreg.; N. G. Wheeler, chief clerk; G. R. Barnhart, fiscal agent.

Lower Yellowstone Project.—L. H. Mitchell, project manager, Savage, Mont.; C. A. Denman, chief clerk; Miss Ruth Lundin, fiscal agent.

Milk River Project.—G. E. Stratton, project manager, Malta, Mont.; E. E. Chabot, chief clerk; J. T. M. Culbertson, fiscal agent.

Minidoka Project.—Barry Dibble, project manager, Burley, Idaho; F. A. Banks, engineer; E. C. Diehl, chief clerk; Miss A. J. Larson, fiscal agent.

Newlands Project.—J. F. Richardson, project manager, Fallon, Nev.; G. B. Snow, chief clerk and fiscal agent.

North Dakota Pumping Project.—W. S. Arthur, project manager and chief clerk, Williston, N. Dak.; H. C. Melaas, fiscal agent.

North Platte Project.—Andrew Weiss, project manager, Mitchell, Nebr.; H. W. Bashore, engineer, Fort Laramie Unit; Paul Roth, irrigation manager; J. R. Ummel, chief clerk; Miss A. L. Perrine, fiscal agent.

Okanogan Project.—Calvin Casteel, project manager, Okanogan, Wash.; W. F. Kubach, chief clerk and fiscal agent; H. J. Gault, engineer, Conconully, Wash.

Orland Project.—A. N. Burch, project manager, Orland, Calif.; E. T. Eriksen, engineer; C. H. Lillingston, chief clerk and fiscal agent.

Rio Grande Project.—L. M. Lawson, project manager, El Paso, Tex.; C. A. Peavey, chief clerk; L. S. Kennicott, fiscal agent.

Riverton Project.—H. D. Comstock, project manager, Riverton, Wyo.; G. H. Baird, chief clerk; J. C. Thrailkill, fiscal agent.

St. Mary Storage Unit.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk; H. E. Bruce, fiscal agent.

Salt River Project.—Being operated by the Salt River Valley Water Users' Association; C. C. Cragin, general superintendent and chief engineer, Phoenix, Ariz.

Shoshone Project.—J. S. Longwell, project manager, Powell, Wyo.; C. M. Jump, superintendent of irrigation; W. F. Sha, chief clerk; L. H. Kline, fiscal agent.

Strawberry Valley Project.—W. L. Whittemore, acting project manager, Provo, Utah; J. E. Overlade, chief clerk and fiscal agent.

Sun River Project.—G. O. Sanford, project manager, Great Falls, Mont.; H. W. Johnson, chief clerk; Miss M. G. Valentine, fiscal agent; G. A. Benjamin, irrigation manager, Fairfield, Mont.

Umatilla Project.—H. M. Schilling, project manager, Hermiston, Oreg.; M. D. Scroggs, superintendent of irrigation; G. C. Patterson, chief clerk and fiscal agent.

Uncompahgre Project.—P. J. Preston, project manager, Montrose, Colo.; A. H. Peach, chief clerk and fiscal agent.

Yakima Project.—J. L. Lytel, project manager, Yakima, Wash.; C. E. Crownover, engineer; R. K. Cunningham, chief clerk; J. C. Gawler, fiscal agent; J. G. Heinz, engineer, Sunnyside, Wash.; J. S. Moore, superintendent of irrigation, Naches, Wash.

Yuma Project.—W. W. Schlecht, project manager, Yuma, Ariz.; R. M. Priest, superintendent of construction; E. R. Schepplmann, chief clerk; E. M. Philebaum, fiscal agent.

INDIAN PROJECTS.

Blackfeet Project.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk and fiscal agent.

Flathead Project.—E. A. Moritz, project manager, St. Ignatius, Mont.; C. J. Moody, engineer; J. M. Swan, acting chief clerk; J. P. Siebeneicher, fiscal agent.

Fort Peck Project.—R. M. Conner, project manager, Poplar, Mont.; Henry Berryhill, chief clerk and fiscal agent.



MINIDOKA PROJECT OFFICE AND EMPLOYEES.

Inset: Barry Dibble, project manager. Left to right: George A. Haycock, watermaster; Andrew Salmon, timekeeper; Hugh L. Crawford, assistant engineer; Bertha L. Sturgis, voucher clerk; Anna J. Larson, special fiscal agent; Margaret E. Scully, stenographer; Serena Robison, telephone operator; Lenaperl V. Wright, bookkeeper; Etta Yingst, water record clerk; Helen D. Holtz, water record clerk; Catherine F. Miller, stenographer; Ellis C. Diehl, chief clerk; Wallace W. McBride, assistant watermaster.

The Reclamation Record

ISSUED MONTHLY BY THE RECLAMATION SERVICE
DEPARTMENT OF THE INTERIOR, WASHINGTON, D. C.

Better Farming : Better Business : Better Living

THERE CAN BE NO Surer INSURANCE FOR THE NATION THAN TO PUT ITS MEN UPON THE SOIL

VOLUME 12, No. 3

PRICE (FREE TO OUR WATER USERS
(SEVENTY-FIVE CENTS A YEAR TO OTHERS

MARCH, 1921



Fowls, numbering over 1,000,000 and valued at over \$1,000,000, are among the smaller assets of our projects.

THE RECLAMATION SERVICE ORGANIZATION.

Its Basic Requirements Under the Law and Relation to Overhead Expense.

THE organization of the Reclamation Service is fundamentally fixed by the provisions of the organic act of June 17, 1902, which makes the Secretary of the Interior the sole executive officer under the Reclamation Act. This basic idea must not be lost sight of as it necessarily shapes the plan of organization.

Accordingly all important functions of the service must center in the Secretary's office, and he must have at hand a corps of assistants who are able to advise with him in person. This makes necessary at least a skeleton organization in Washington, which has been kept down to the lowest practicable limits and is about 90 persons.

The Washington office of the service is in charge of the director, and consists of several subdivisions as follows:

Lands and Contracts, Legal, Engineering, Accounting, Chief Clerk's office, Settlement and Photographic, Editorial, Mails and Files, and Appointments. The names indicate their functions, and their work concerns matters which are of a general supervisory character.

The immediate supervision of the projects is placed in the Denver office, which is organized with somewhat similar branches, and which is intended to coordinate the work of the several projects and to supervise all matters that do not necessarily come to the Secretary and must be dealt with in connection with other departments at Washington.

Other things being equal a more effective organization might be created if the headquarters for the entire Service had been fixed in some central western city, for example, Denver. This, however, is contrary to the policy of Congress, and has rarely if ever been done with an important organization of general character.

Many essential duties are performed by the Washington office which can not be handled at any other place because of the relation of the Service to the Secretary of the Interior.

A large amount of correspondence and a large number of questions are constantly referred to the Director's office by the Secretary's office. Many matters are presented personally as well as by letter by Members of Congress and others either to the Secretary of the Interior or to the Director, which frequently must be disposed of immediately and therefore require that a complete general knowledge of the project work be available.

The relations of the Service with the Treasury Department are complicated and require close personal contact in order to secure the most satisfactory

results for the smooth operation of the work. Difficulties and delays in the handling of vouchers and the payment of claims can be best avoided by close cooperation. It can be confidently asserted from knowledge that the financial business of the Service is more promptly and effectively conducted than that of many bureaus in Washington.

The relations of the Service to the Land Office are intricate and require frequent conferences and much correspondence. Similarly the Director's office has many important dealings with the Geological Survey, the Civil Service Commission, the Forest Service, and other bureaus in the Agricultural Department, as well as with the Department of Labor. It would be impossible to enumerate the countless details which are presented, to the Director's office for immediate consideration and decision.

Among the most important reasons for maintaining the Washington office is the necessity of appearing before committees of Congress regarding the appropriations for the Service and legislation affecting its interests. Furthermore, close touch must be kept with the Department of Justice, which supervises all the litigation affecting the Service, and also with the Court of Claims, where large claims against the Service are adjudicated.

All these features of the work involve care and tact to secure and preserve harmonious relations; otherwise, serious delays and misunderstandings with other bureaus may arise, which would be detrimental to the efficiency of the work and result in an actual money loss to the water users.

The details of a part of the operations of the Washington office in the year 1920 will doubtless be of interest.

Contracts for collection of funds were handled by that office numbering 131, and involving more than \$16,500,000, covering cost of construction in irrigation districts, the sale of rights to stored water, rental of water, land, power, etc., not including the water-right applications handled. Disbursement contracts were handled numbering 151, and involving more than \$1,400,000 for construction work, purchase of machinery, equipment, and other property. Besides these there were 81 miscellaneous contracts not involving collections or disbursements, making a total of 363 contracts.

More than 1,000 contracts were handled, including those for use in examining vouchers and claims, of which 4,400 claims were settled for freight, passenger, and express charges.

During the year about 26,000 inquiries were received from ex-service men and women relative to land oppor-

tunities, and each was answered in greater or less detail. In addition, there were 4,500 land inquiries from others.

More than 1,500 maps and diagrams were prepared, many of them involving a large amount of work. Over 9,700 maps and miscellaneous drawings were distributed to the project officers and others. Hundreds of other documents were distributed and in addition the necessary work was performed for handling and keeping up the lists for mailing about 20,000 copies of the RECLAMATION RECORD.

Requisitions for printing at the Government Printing Office require much time and care; of these 294 were handled.

A large amount of work is involved in keeping the personnel records, which covered 1,178 changes in status of employees.

The photographic laboratory made 11,275 prints and 525 slides, besides developing 1,400 negatives and making and printing 87,000 feet of motion-picture films. This work was done principally for the projects, but there were sales producing collections of \$11,500. There were 30 lectures delivered both in the East and the West, to acquaint the public with the work of the Service and the opportunities offered for obtaining homes. Forty sets of slides and motion pictures were loaned to persons all over the country for use in delivering lectures on the reclamation work, but the number of lectures so given is not known.

Bills pending in Congress proposing the enactment of laws affecting the work of the Service are often referred to the department, and the Director submitted to the Secretary reports on 53 such bills which required much work and great care.

The close relations of the Service with the General Land Office call for the disposal of matters regarding land entries, of which there were about 200 cases, applications for rights of way over the public lands for the use of water for irrigation, power, etc., the construction of railroads, etc., of which there were 157 cases, and there were also 150 changes in the status of lands related to the projects by withdrawal from entry and restorations to entry, affecting 2,756,000 acres.

The recent establishment of the Federal Power Commission and the enactment of the law regarding leases of public lands for oil prospecting, etc., have caused the Service a large amount of work in the five months since they have become active. However, the two acts will produce revenue for the reclamation fund, the former in a small amount and the latter in very large amounts. As required by the law, the Service has detailed four employees to the Power Commission, at a cost thus far of \$1,619.14, and has begun work on the reports relative to about 30 power applications. The applications for oil prospecting leases handled are 279 in number.

Nearly 99,000 pieces of mail were received, among them about 20,000 requiring replies; many of the others involved a great deal of work, as they related to matters requiring examination and transmittal to other offices.

The Denver office, from which the general control and supervision of the work of the projects in the field is administered, has the following divisions: Administrative, Legal, Clerical, Cost and Property, Purchasing, Designing, Electrical, Drainage, and Secondary Investigations. The chief engineer is in general administrative and supervisory charge of all work in the Denver office, on the several projects, and in the field in general. He is assisted by two assistant chief engineers and the heads of the several divisions named above. The chief engineer, the assistant chief engineers, the engineer of cost and property, and the engineer in charge of designs spend a considerable portion of their time in the field. It is intended that at all times either the chief engineer or one of the assistant chief engineers shall be in Denver in charge of operations.

The office engineer reviews reports made by the projects, specifications for contract work, contracts, applications for extension of time on contracts, estimates and authorities for work, applications for rights of way over public lands, reports on applications for oil prospecting permits and power permits, and miscellaneous articles for publication.

The district counsel in charge of the legal division advises and confers on legal and administrative matters with the Chief Engineer and his assistants. Considerable time is spent in conferences with field district counsel and with the United States attorney and special assistant to the Attorney General in connection with pending litigation. The legal phases of all operations of the field service are followed in detail so that immediate action can be taken when necessary or desirable.

The clerical division is subdivided into the following sections: Mails and files, stenographic, disbursing, bookkeeping, and personnel. In 1920 there were received 143,863 letters, and 25,431 requests for correspondence were handled. In the disbursing section 17,839 vouchers were paid, amounting to \$3,997,428.31 and 355 collection vouchers were handled, amounting to \$241,900.54. In the bookkeeping section accounts are kept for the Denver office, field legal offices, and secondary projects. The personnel section keeps all personnel records and handles correspondence in connection with personnel.

The work of the cost and property division falls into three more or less distinct groups, namely, estimating, cost keeping, and equipment supervision. All allotments of funds and estimates for work are examined as to costs, source and availability of funds, and conformity with approved plans. Estimates and authori-

ties and requests for allotments to the number of 450 were received and handled during the past year. The monthly cost reports from 28 major projects, the Denver office, and the secondary projects are critically reviewed. Cost data for general project distribution are compiled and issued in quarterly and annual statements. Periodic statements of cost data for completed structures are issued and special reports and data furnished as required. Card records of all equipment on the projects and in the Denver office are maintained. Supervision is maintained of the disposition of all equipment and supplies, and of transfers of equipment and supplies. Advertisements are issued at suitable intervals for the sale of useless equipment. During 1920 transfers of equipment and supplies were effected to the value of \$86,600 and the receipts from sales amounted to about \$75,000.

The purpose of the purchasing division is to secure equipment, tools, materials, and supplies for the projects. Vouchers for purchases made in the Denver office, as well as for many purchases by projects, are prepared in this division. The transportation clerk furnishes freight and express rates for awarding orders properly, for the transfer of property from one project to another, and to projects when requested. In 1920 there were issued 4,306 advertisements, resulting in purchases, the gross amount of which was \$1,334,036.20. Discounts amounted to \$14,149.69, making a net expenditure of \$1,319,886.51. In payment for these purchases 5,247 vouchers were prepared.

The work of the designing division includes the preparation of designs for all major structures for all projects and designs for minor structures that can not be taken care of in the project offices, the checking of all designs for minor structures prepared by the projects and submitted for approval, the preparation of advertisements and specifications for all material requiring engineering knowledge in its purchase, the inspection of engineering material manufactured or purchased in Denver and nearby cities, the making of studies and the preparation of comparative cost estimates of various plans for proposed features of considerable magnitude, and the preparation and distribution of standard plans and specifications for use on the various projects. In 1920, there were prepared 85 formal advertisements and specifications for the purchase of construction machinery, metal work, etc. The total estimated expenditures under these specifications was approximately \$925,000. Detail designs were prepared for 100 major structures, mostly of concrete. Fifty designs for major structures prepared by project offices were reviewed and checked. There were also prepared 20 designs for special large-size gate installations for canal structures, 50 maps, 20 designs of structures of a standard nature, 10 comprehensive estimates of cost for large features and units for various projects, and 35 drawings to accompany a report on high pressure outlet gates. The

mechanical section completed standard designs for 17 radial gates, 14 cast-iron gates for heads 15 feet and less, 26 turnout gates, and a few other gates of miscellaneous sizes. Work was gotten well under way on the design of cast-iron gates for heads ranging from 15 to 30 feet and from 30 to 50 feet, also on power-gate hoists from 20,000 pounds to 44,000 pounds capacity. The dam-designing section prepared preliminary designs and estimates for 27 storage reservoirs and diversion dams, the total estimated cost of which is about \$278,000,000. Considerable work was done on the revision of standard specifications. A number of drawings and tabulations were made of data to be used in the office in designing. An extensive report was made on the construction and use of lock-joint pipe, and standard designs for this pipe for use by the service were gotten well under way. About \$100,000 worth of machinery, metal work, and other material was inspected. In the aggregate about 585 tracings of various sizes were prepared.

The principal functions of the electrical division are the investigation of and preparation of reports on proposed power and pumping developments, the preparation of specifications for the purchase of electrical and power equipment and the design of the important electrical and mechanical works of the service. General supervision is given to the construction of the features designed and to the operation and maintenance of power plants, pumping plants, telephone systems, sale of power, and related work. The electrical division has been largely responsible for the development of the designs for the high-pressure reservoir outlets of the service. During the calendar year 1920, preliminary studies and estimates aggregating \$85,000,000 were prepared for a large number of power and pumping plants on various projects. Authorized construction work for this period is estimated to cost \$1,000,000 and included work on several projects. There are now in operation or under construction 18 power plants, aggregating 37,000 kilowatt capacity and 86 pumping plants aggregating 14,700 horsepower capacity.

The drainage division, consisting of the drainage engineer and one assistant, acts in an advisory capacity to the projects on drainage matters. The major portion of the time of the drainage engineer is spent on the projects. He assists the project managers in outlining investigations, in the preparation of designs, in providing proper equipment, and in the improvement of methods of construction. It has been necessary to purchase a large amount of excavating machinery and after this is put in operation the operation must be followed closely so that the best methods may be adopted and so that on each piece of work that type of machine shall be used which is best suited thereto. During the year 1920, 31 dragline excavators of various types and sizes and 12 ditch-cleaning machines were purchased, the total cost of these laid

down on the work being about \$838,000. The total expenditure made for drainage work in 1920 was about \$996,000. A rough estimate of the number of miles of drains constructed is 65 miles of open drains and 8 miles of tile drains.

This gives an idea of the large amount of detail which must necessarily be left by the Washington office to be taken care of by the Denver office.

In addition to this it must be borne in mind that a very large mass of detail in administration, construction, and operation and maintenance work is handled directly under the supervision of the several project managers and their assistants.

OVERHEAD EXPENSE.

The cost of operating the Washington and Denver offices is prorated among the projects as nearly in proportion to the amount of work done for the benefit of the several projects as is practicable within reasonable limits of work. The plan in detail is as follows:

Wherever possible special or direct charges are made against the project for which special work is done, and cover such items as photographic work, drafting work fiscal inspection, and stationery and supplies.

This covers only part of the total cost which is of a general nature, and the balance is distributed to projects in the ratio that the disbursements for each project bear to total disbursements.

The matters presented in this statement will make clear to the water users and others interested in the projects the reason for the maintenance of the Washington and Denver offices and shows that the overhead charges prorated to the several projects are no greater than should reasonably be expected.

The entire overhead charge of the Reclamation Service, including the general work in the project offices, is materially less than is found in most organizations of a comparable size, ranging in the several years since its organization from 6.27 to 15 per cent, averaging 9.3 per cent.

RESULTS OF IRRIGATION ON OUR PROJECTS.

(NOTE.—In the issue of the RECLAMATION RECORD of February, 1920, we printed a statement prepared by Project Manager Barry Dibble, showing the tangible results in dollars and cents, of irrigation on the Minidoka project, Idaho, and presenting incontrovertible evidence of the transformation which has followed the application of water to formerly uninhabited sagebrush desert. Prosperous farms and towns have sprung up overnight where the jack rabbit and the coyote formerly had their haunts. Similar conditions are found in the development of practically all our projects. For the information of our readers we plan to present from time to time statements from our projects showing the remarkable results of irrigation such as the following.—Editor.)

Huntley Project, Mont.

By William M. Green, Project Manager.

THE Huntley project was opened to entry on June 26, 1907. Prior to this time the area comprised within its limits was a typical western sagebrush flat supporting only a few head of range stock. Subsequent to settlement the maximum crop production has reached in round numbers \$950,000 for one year. The net construction cost to December 31, 1920, was \$1,442,132.15.

Nothing has been included in the following statement regarding the commercial values of imported manufactured products, or of export car shipment of farm materials, etc. There is no organization of the commercial interests on the project, thus no secretary or other person is employed who would be interested in accumulating these data.

YEAR OF 1920.

Values created.

Value of farm lands and improvements on the project, estimated by owners at the close of 1920	\$3, 158, 882. 00
Value of live stock	405, 292. 00
Value of farm equipment	259, 707. 00
Total	3, 823, 881. 00

Values of crops produced in 1920.

Alfalfa	\$134, 000. 00
Wheat	120, 041. 00
Sugar beets	177, 769. 00
Oats	16, 667. 00
Miscellaneous	95. 304. 00
Total	543, 781. 00
Total value of crops produced as reported since 1910	5, 545, 452. 00

Other significant statistics, 1920.

Number of farms	609
Number of towns	8
Population	2, 450
Irrigable area of farms reported	27, 468
Acreage in crop	20, 021
Public schools	8
Churches	6
Newspapers	1
Banks	4
Capital stock	\$95, 000. 00
Deposits	\$588. 362. 00

<i>Industries.</i>		Water supply is derived from the Yellowstone River, with no storage facilities. Water is pumped for—acres—	
Cheese factory	1	Miles of canal operated	5,400
Creamery	1	Miles of closed tile drains maintained	299
Elevators	5	Miles of open drains maintained	50.50
Railroads	45		15.50

Newlands Project, Nevada.

By John F. Richardson, Project Manager.

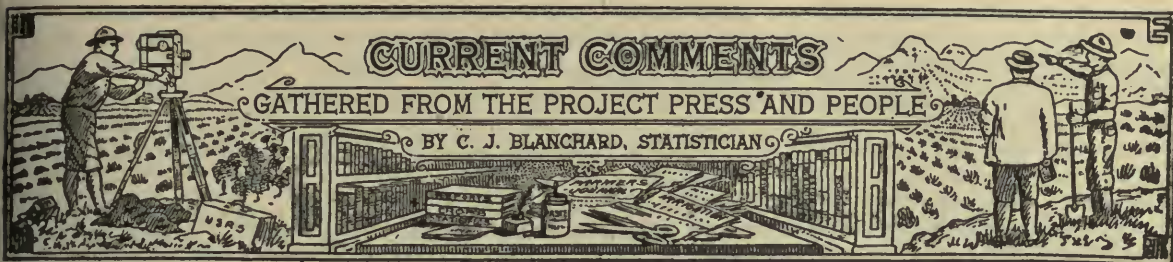
YEAR OF 1920.		Cars.	
<i>Values created.</i>			
Value of farm lands and improvements on project estimated by the owners at close of 1920	\$9,195,950	Grain	28
Value of live stock	997,468	Potatoes	17
Value of farm equipment	449,050	Miscellaneous	263
Total	10,642,468	Total annual shipments	2,912
<i>Assessed valuation.</i>		<i>Other significant statistics, 1920.</i>	
Farms	2,114,000	Number of farms	742
Towns	1,100,000	Number of towns	5
Public utilities	12,012,000	Population	5,268
Total	15,226,000	Acres supplied with water	45,611
<i>Value of crops produced in 1920.</i>		Acres in crop	44,573
Alfalfa	1,299,466	Public schools	12
Potatoes	44,160	Churches	8
Grain	193,996	Newspapers	3
Miscellaneous	148,779	Banks	2
Total	1,686,401	Capital stock	\$115,900
Value of crops produced since 1909 (actual census)	10,604,284	Deposits	\$864,360
<i>Shipment of agricultural products, 1920.</i>		Number of depositors	2,500
Alfalfa hay	1,978	<i>Industries.</i>	
Alfalfa meal	136	Sugar factory	1
Live stock	490	Creamery	1
		Flour mill	1
		Alfalfa meal mills	2
		Railroad, 50 miles.	
		Electric power generated in project power house (leased), 1,800 horsepower; supplies five towns, and mines.	
		Water supply of project: Truckee and Carson Rivers, with storage in Lake Tahoe, Calif., and Lahontan Reservoir, Nev.	
		Lake Tahoe, capacity 120,000 acre-feet (under proposed plan of regulation).	
		Lahontan reservoir, capacity 290,000 acre-feet.	

Umatilla Project, Oreg.

By H. M. Schilling, Project Manager.

YEAR OF 1920.		<i>Crops.</i>	
Net construction cost, June 30, 1920	\$2,400,000	Value of crops produced in 1920	\$520,000
<i>Values created.</i>		Value of crops produced since 1912	2,360,000
Value of farm lands and improvements on project, estimated by the owners at close of 1920	\$3,800,000	<i>Shipment of agricultural products in 1920.</i>	
Value of live stock	330,000	Boardman:	Carloads.
Value of farm equipment	136,000	Hay	85
Total	4,266,000	Wool	1
<i>Assessed valuations.</i>		Hermiston:	
Have not been able to secure this information; estimated at approximately	\$2,500,000	Hay	598
		Mixed stock	2
		Hogs	8
		Sheep	5
		Alfalfa meal	19

(Continued on page 103.)



THE season is here when tree planting on most of the projects might occupy to advantage some of the attention of our farmers, their boys and girls. Last year we were pleased to note that a number of our farmers had given thought to this subject and had set out trees of several varieties along the roadsides, ditch banks, and about the homes. This movement set in some years ago on the Orland project, where concerted efforts were made to encourage tree planting. The results have been most gratifying. Numerous lanes are now shaded with thrifty fruit and nut trees; unused fence corners and the banks of many farm laterals are planted to varieties indigenous

to that section. In a few years the fruit and nut trees will be returning a revenue which will show a fair profit on the investment. The improved appearance of the farm adds greatly to its value.

To those of our farmers who will interest themselves in this matter we shall be glad to furnish suggestions as to varieties and time of planting. Our recommendation is to plant a few nut trees if they will grow and in addition, of course, such varieties of fruit as are adapted to the climate and soil. Black walnuts, butternuts, and hickory nuts do well on the northern projects. In the warmer latitudes English walnuts, almonds, and pecans are ornamental and profitable. A few nut trees in bearing will augment the food supply materially. The children should be encouraged to take an interest in this task, and by giving them a proprietary interest in the products it is probable that they would give their trees proper attention.

On many of the farms the absence of hardy small fruits was noticeable. Neglect to plant a few raspberries, blackberries, and currants is an economic blunder which is chargeable to the farmer's wife. A winter's supply of canned fruit put up from the home garden cuts down the grocer's bills and at the same time gives the family a better grade of fruit. Large families find it profitable to set out half an acre in such fruits, the local market demand for fresh fruit being usually in excess of supply. Give the youngsters a part of the profits as an inducement to care for the plot.

A good friend from Powell, Wyo., commenting on our remarks in a recent issue on the subject of tenantry and its attending evils, writes as follows:

I was greatly interested in reading your article in the RECLAMATION RECORD of January, 1921, about the evils of the landlord and tenant system, but you say there is no remedy that will entirely cure the evil. I beg to differ with you. Why not abolish the system altogether? It can be done by recognizing the natural right of every person to a home of his own in this world or he would not be here. Some writers say limit the number of acres to any one person; others say to have the Henry George system of the single tax on the land values. Nearly every one admits that landlordism is a curse and should be abolished and occupants should be the owners. Now, my remedy for landlordism is this—abolish the forcible collection of rent for land, either farm land or town lots, and stop the sale of land from one landlord to another party that already is the owner of one or

Results of Irrigation.

(Continued from page 102.)

Hermiston—Continued.	Carloads.
Wool.....	2
Flour and feed.....	1
Apples.....	3
Corn.....	1
	639
Irrigon: Hay.....	28
Peters: Hay.....	3
Umatilla:	
Hay.....	82
Hogs.....	1
Barley.....	1
Sheep.....	8
Cattle.....	9
Horses.....	2
	103
Total.....	859
Wholesale purchases of manufactures during 1920 not possible to classify approximately.....	\$1,000,000

Other significant statistics, 1920.

Number of farms.....	700
Number of towns.....	4
Population.....	2,800
Acres supplied with water.....	12,000
Acres in crop.....	10,200
Public schools.....	6
Churches.....	4
Newspapers.....	1
Banks.....	1
Industries, alfalfa mill.....	1

Railroads: Oregon-Washington Railroad & Navigation Co. traverses entire project.

Storage: Cold Springs Reservoir; capacity, 50,000 acre-feet.

Area, present project, 28,300 acres.

more tracts of land. One home and a place of business is enough for anyone, just the same as one wife to a man or one seat in a theater to any one person. If this were the law of the country, landlordism would soon fall with its own weight, nobody would be hurt, and every person that wished to get a home of his own would soon be able to buy one at a reasonable price.

The above reads like pretty strong radicalism and is certainly opposed to an age-old policy of landed ownership. Coming as it does from a man who succeeded as a farmer, a merchant, and a financier, we confess our surprise. Were it possible by law to put such a policy in force, we are still doubtful as to its bringing about a millennium where every man would have a home. The currents of humanity are shifting and variable. Not every man wants a home with its proscription of freedom. Would not such a policy tend to lessen ambition? Acquisitiveness of land in quantity has been a mighty force in the conquest of new worlds and the development of vast areas of deserts and wastes. Merely to win a home plot would not have been sufficient incentive to have lured the great leaders who won to civilization and progress the dominions which to-day support millions of people.

The activities of the farm bureaus of the West cover a wide range and include a number which a few years ago would have been regarded as impractical and of no importance. In the very vital task which the bureau has undertaken of coordinating farm production and marketing there is real progress in many sections. The lessons of careful seed selection, proper preparation of the soil, and cultivation are bearing fruit in increased yields and better crops. Marked improvement in herds and flocks is evident and is bringing rewards. Hygiene and numerous other domestic and social problems have received attention, and the betterment of conditions on the farms is unquestionable.

The latest department created in the Farm Bureau Federation of California is concerning itself with public utilities. In other words the farmer is looking into the public service problems which relate to his business. In California, where electric power is of such general use, questions of rates touch the farmer irrigator whose water supply is developed by electric pumps from wells.

The Farm Bureau is studying valuations and assembling data of all sorts and kinds to protect its members from excessive rates for power. The investigations also include transportation systems, express companies, and various other agencies. Public utilities in California must come through clean or the rates won't go up, says the Farm Bureau.

It may not do any good to tell what others have done, but just to get it off our chest we beg to remark that Australia has appropriated £15,000,000 for the encouragement of ex-service men to acquire land, and is looking after 12,000 of her heroes who are in the

process of becoming independent home owners. Our neighbor on the north is also in the game with liberal aid for her loyal fighters.

The press of our projects and numerous letters received during the month reveal a trifle more cheerful attitude of mind on the financial situation. As one chap writes:

The slump hit me such a wallop that it almost knocked me out. Things have been breaking pretty easy for us out here during the past four years, long enough at any rate to make us careless and forgetful. Apparently none of us was prepared for the jolt. Lack of forward looking is what put us in the predicament in which we found ourselves. As I see things now I must have been plumb crazy not to have banked on what happened and fortified myself against this evil day. Looking back over 30 years of a fairly successful farming career, I can recall other reactions comparable with this and I guess if I live long enough I'll see others. This isn't the first time farmers have had to face unsatisfactory markets, financial losses, and no money from the banks, not by a long shot. Of course, we all squeal about it, but although we emit the calamity wail vociferously we regard it as our right and privilege to "holler," but you'll observe we are not quitters. I've decided after all that things might have been worse. I realized that fact most clearly after my last visit to the city. Seems to me I never saw so many men out of work. When I saw that bunch of poor devils walking the cold streets panhandling everyone for a meal and then remembered my comfortable home with its cellar stocked with plenty to eat, things no longer looked so dark. Back home again surrounded by my family, all lusty and well fed. I came to the conclusion that the thing for me to do was to buck up and get to planning for this year's business. Of course, I know things are rotten, but then they might be worse, you know. We farmers, as I see it, have got to take up our burdens and get in the collar again. The world needs us a little longer, and hanging out mourning for past mistakes and troubles will not get us anywhere. But let me tell you this, old man, I'm not going to be caught again all spread out like I was this time. I'm going to salt away a nest egg for just such an occasion as the one which hit me in 1920.

That's the spirit, and it has the true western ring. No use talking, you can't wear crêpe gracefully in the "Sunshine Land of the West." There's a tonic in its air and courage in its vastness. Men there are often down, but seldom out. Better times are coming; let's all take a new grip on things.

If what we write sounds too cheerful, attribute it to the fact that owing to the fall in prices we have been able to purchase a new overcoat and a pair of shoes, both of which were much needed, but until the slump had been classed as dreams only.

January was a pretty busy month for the statistician, whose lecture dates called him to New York City for six lectures and to Philadelphia for one. In addition there were two others in Washington. February started off with four more in New York, another in Pittsfield, Mass., one at Hampton, Va., and two in this city. We are showing the eastern folks our late western pictures, and they seem to please.

The requests for our films are steadily growing. One call is urgent, and that comes from the American Legion's numerous posts.

Recent Snake River Valley pictures, Klamath, and Flathead, have been circulated, and we are straining to get out Salt River, Yuma, Rio Grande, Sun River, and others as quickly as our printers can prepare titles.

We are hearing a lot of hard luck stories these days, but the one we got the other day from A. E. Carlton, president of the Holly Sugar Co., tops the list. According to Carlton, a Colorado rancher consigned a trainload of sheep to a Kansas City commission house. In due time he received a telegram stating "Sold your sheep and paid freight. Balance due us for commission and freight \$300. Send check." The stockman wired back promptly, "Have no money, shall we send more sheep?"

NOTED HERE AND THERE.

Arizona, Salt River project.—In order to bring back the dairy stock unwisely disposed of while the craze for growing long-staple cotton was at its peak, steps are being taken to finance all farmers who desire to return to dairying. The large creamery corporation whose business was shut down is said to be offering to purchase high-class dairy stock for its patrons on easy terms. One plant alone will require 5,000 cows before starting operations, so that Salt River Valley should prove a fine market for the excess stock of other projects.

The development of 38,000 acres of land in the vicinity of Mesa and Chandler is projected by a corporation in the valley. A bond issue of \$1,500,000 is proposed, and it is stated that California capital has expressed a willingness to take the bonds. The lands will be under what is known as the Auxiliary Eastern Canal, and will be supplied from wells. A contract will be presented soon to the Salt River Valley Water Users' Association and the Secretary of the Interior for approval.

Arizona, Yuma project.—Attention of homeseekers is called just now to a condition existing in Yuma Valley which is of particular interest to them. By a recent order of Secretary Payne 10,000 acres of land in private ownership must be sold before December 1, 1921. This land represents the excess holdings of homesteaders and others which under the provisions of the reclamation law must pass to new owners in order to obtain water from the Government canals. We have received no listings of these lands as yet, but are informed that prices are reasonable, in fact much lower than a year ago. The necessity for transfer before December 1 naturally has depressed values, but this is to the advantage of purchasers. Spring opens early here, so that prompt action is suggested in order that crops may be put in. Much of

the land is now ready for planting and farm operations may begin immediately. Inquiries should be addressed to the project manager or to the Chamber of Commerce at Yuma. A few fine units on the mesa remain unsold, and information concerning these will be supplied upon request to the project manager.

California, Orland project.—A trifle more than three years ago came a man from Nevada with a little bunch of hogs and a big idea. The man was R. J. Yates, and his idea was that he could breed up a type of Poland-China hogs which would make a name for him. His selection of Orland as a location was no mistake, as results have shown, and his good judgment and conscientious efforts as a breeder have been rewarded by his herd of high-class porkers. In the beginning he began selecting the very best eastern stock conforming as closely as possible to the type he had in view. To-day the name of Yates among breeders of Poland-Chinas is synonymous with high class. Among his stars are Big Orphan, Black Bob, Y's Big Wonder, and a half dozen others that have been regarded as princes of the royal family of Poland-Chinas. Recently Mr. Yates negotiated the sale of his herd to Fred A. Clark, of Glenn County, but with the proviso that he goes with it to manage a larger effort along similar lines. The Record frequently has had occasion to mention the triumphs of the Yates herd in the prize ring. It is a pleasure to learn that the splendid work so well launched by Mr. Yates is to be continued and on a larger scale.

Some conception of the exodus of Idaho farm folks to Orland, the Project of No Regrets, may be had by reading of the New Year party held at Orland, which nearly 200 people recently hailing from the Gem of the Mountains attended. Orland's welcome to the northerners has been most cordial and the festivities indicated that the Idaho folk were there to stay.

Colorado, Grand Valley project.—Grand Valley boasts a real live farm loan association that is proving a boon to its members. This is the Kannah Creek Farm Loan Association. At its recent annual meeting the directors distributed the third annual stock dividend of 3 per cent to its members, and were promptly reelected.

A welcome February visitor to our office was D. W. Aupperle, for many years secretary of the water users' association at Grand Junction, and at all times the booster of the project and the valley. Mr. Aupperle brought a rather cheerful message from the Western Slope. Farmers out there are having their trials and tribulations, it is true, but compared with those of other sections they are in far better shape. He advocated to the department enlargement of drainage work, the taking over of Orchard Mesa, and the completion of the high line.

Olathe, the hub of the Uncompahgre valley and a big distributing point for Colorado's aristocratic

spuds, is planning this spring to erect a \$60,000 high school. The discussion of plans reveals a diversity of opinion, one side arguing for a structure devoted exclusively to regular school work and the other favoring the inclusion of a commodious auditorium. If it would not be regarded as presumptuous, we would suggest to the school board that it take up the subject with the authorities of Burley, Idaho, and ascertain how they view the auditorium idea. Burley's splendid electrically lighted, heated, and ventilated high school has a fine auditorium equipped with a stage, motion-picture projector and stereopticon, and a kitchenette. It is used for special class work on school days, and is the place for numerous meetings of community clubs, social organizations, and special entertainments. It affords an opportunity for developing the talent of school children in music, oratory, and dramatic art. Having the equipment for projecting motion pictures the school is able to obtain numerous educational reels and the auditorium is often visited by lecturers of note. The social gatherings here include country and town folks and are always well attended. We are coming to recognize more strongly each year the importance of a closer linking up of town and country interests, and the high-school auditorium in regions where schools are consolidated is just the place in which to bring all the valley in friendly communion. It was at our suggestion that the Burley school board purchased the motion-picture outfit, and we furnished the films for two entertainments. Revenue from ticket sales sufficed to pay the cost. We stand ready to provide the pictures for such a show when Olathe is ready to put it on. A few thousand dollars additional spent on a first-class auditorium payable in a bond issue will not be felt seriously. We venture to suggest that the school board call upon the Bureau of Education, in the Interior Department, to furnish plans of various types of modern high schools before definitely deciding upon the Olathe building. A fine school building is about the best advertisement a town can have.

Idaho, Minidoka project.—Nearly 150 of the sugar-beet growers have organized for the purpose of bettering the conditions of those engaged in this industry. It is gratifying to report that the representatives of the sugar factory were in attendance and gave helpful advice in perfecting details of the organization. Facts and figures concerning the cost of production, method of disposal of pulp, and other interesting subjects were explained. Based on a crop of 8 tons per acre, the average for this section, the cost of producing beets ranges from \$65 to \$85 per acre. In order to make the industry attractive to the grower it was deemed necessary to insure him \$103.75 gross an acre for his crop. It was the consensus of opinion that the California contract was more adaptable to this section than the Mountain State contract. The former bases the net price per ton on the average net price f. o. b. factory received for sugar sold

by the beet-sugar companies of southern California (after deducting any tax on sugar not now but hereafter imposed by law) during the period of 12 months beginning July 1, 1921. The growers present asked for a fixed price this year of \$12 per ton.

The progress shown on the project during the past four years if maintained a few years longer presages a time when the good folks out there are going to be sufficient almost unto themselves. Having the advantages of electricity instead of coal for fuel, power, and light, manufacturing their own sugar, and producing in abundance about everything they want for the table except tea and coffee, with wool grown at home and readily manufactured into wearing apparel, it is not surprising that these folks are of independent mien. Just to insure a greater degree of freedom from the trusts there has been established recently an up-to-date packing plant at Rupert, which is going to take care of a lot of choice home-grown and fattened beef cattle, hogs, and sheep. If you want to dwell among the live ones, move out to the Minidoka project.

Farmers' discussions throughout the project permit a forecast on this year's crops. It is evident that the sugar-beet acreage will hold up well with that of last year. Indications also point to the average area in wheat with perhaps some additional grown on fields last year in beets. Wise ones declare this is the year to plant spuds, following the adage "set in when seed is cheap and stay out when seed is high." Owing to the big surplus of hay it is likely that a lot of alfalfa land will go in potatoes this season.

Everywhere farmers are agreed that production costs must be lowered unless prices for farm products jump forward. A very essential factor must not be overlooked, and that is an effort to increase the average yields per acre of all crops. By better methods of cultivation, more careful selection and treatment of seed, and attention to irrigation a 20 per cent increase in yield can be obtained and without adding materially to cost of production. It seems to us that these points can not be stressed too emphatically. Minidoka project shows an astonishing difference in maximum and minimum yields in sections where soil and other conditions are the same, and this indicates lack of care on the part of one lot of farmers whose neglected fields are responsible for lowering the average for all the project.

Montana, Flathead (Indian) project.—They are going strong on the Flathead this winter and planning to get a place in the sun more in keeping with their worth. No fairer region lies out of doors than this beautiful valley nestling under the shoulder of the splendid Mission Range. It is a paradise of lake and forest, snow-tipped mountains and broad vistas of rolling valley and plain, and it has a soil of surpassing richness which responds magically to the kiss

of water and the plow of the husbandman. Slowly but surely its broad acres are coming under cultivation, handsome homes have sprung up, and lowing herds of high-grade cattle have taken the place of the buffalo of old Indian days. Our friend the red man had an eye to beauty when he planted his teepee beside the swiftly flowing streams or on the margins of these beautiful lakes. Here nature was kind in furnishing fuel and food, and his days were contented. But civilization swept westward and enveloped him. Slowly he is emerging from the primitive state into the larger field of modern life. A few yield reluctantly, many not at all, content to remain as their fathers. Unable to wrest their living wholly from the forests and the waters, they cling to rations doled out by the Government agent. The larger number, we are glad to note, are appealing strongly for the right to live as citizens, their feet on the soil which is theirs, and financed from the tribal funds which are yet withheld from them.

On the ceded lands the energetic white man is showing his red brother the rewards of industry. From the mixed bloods we look for real progress. There are many intelligent leaders among them, and their position is one of peculiar importance in the valley if they will but rise to it. They possess, as no white man does, the confidence of the Indian, and on them rests a duty which should not be shirked of bringing the red man to a realization of his true relation to the new order of things. Infinite patience should be exercised in directing the Indians along the pathway to independence. Many of them are children so far as the ways of the white man are concerned, and in justice to them too much must not be expected of them. Many white men fail in their undertakings, and we are not surprised. Isn't it a bit unreasonable on our part to expect the Indian to do better at farming than the white man? Why is it, then, that we are so prone to criticize the untutored savage who falls down on a job for which he has had no training and often no inclination? The experience the Reclamation Service has had with its Indian laborers, while not entirely satisfactory, on the whole has furnished convincing evidences that he is by no means hopeless as a worker. The Apaches, whose work on the Roosevelt road in Arizona is a shining example of industry, the Blackfeet, many of whom have proven even better than the class of drifting white laborers upon which the Service had to depend, are examples to which we may point as showing the ability of the Indian to make good as a worker.

Nebraska-Wyoming, North Platte project.—The big interstate project received just recognition recently from R. P. Crawford in an article in one of Nebraska's leading farm journals. We regret that lack of space will not permit reprinting the whole of it in the RECORD. In reviewing the favorable conditions which exist on the project for intelligent and prac-

tical farmers the writer devotes some space to the stories of H. J. Lenhart and Peter Janssen, both of whom are homesteaders on Dutch Flats. The former filed on his homestead of 80 acres in 1909, and was the possessor of a capital of \$850. To-day he has a modern bungalow and excellent buildings. Cement walks shaded with fine trees add a touch of the suburban to the place, and the neatly painted fences and clean yards indicate tidiness and good taste. Mr. Lenhart's success as a farmer, measured by the yardstick of the financier—the dollar—is noteworthy. In 1920 the ranch showed a net profit of \$7,500.

Off of 18 acres of beets he took in \$1,600, and the yield was 20 tons to the acre. He had 22 acres of potatoes. From one 10-acre patch he got a yield of 425 bushels an acre, from another 10-acre patch 375 bushels, and from a 2-acre patch also 375 bushels. The first 10 acres sold for \$2.15 per hundredweight. Three carloads went for \$4 and some on the windup brought \$5 and \$5.50. All told there were about 9,000 bushels of potatoes, the best paying crop on the place. Mr. Lenhart also fed 780 sheep and made \$2,000 net profit on them. Twenty acres of small grain were also raised. Barley went 70 bushels to the acre and oats 60. He has his own potato cellar. The principal varieties of potatoes raised are Kings, Downings, and Pearls.

Peter Janssen, who lives in this same part of the county, says that when he homesteaded in 1907 he thought it was a "fool idea" cutting the homesteads down to 80 acres, but now he believes 80 acres almost too big. While, as he says, the rotation depends on the grasshoppers, 5 years' rotation of crops is adhered to as far as possible. Alfalfa is broken for potatoes, then come beets, then one year of small grains, and then two years of alfalfa again. Naturally, with such a rotation there can be but 15 acres of beets a year on 75 acres of farm land.

The barley last year went 92 bushels to the acre and this year 70 bushels. Sometimes the rotation loses out and this year there happened to be 25 acres of potatoes. Nine thousand bushels of potatoes were raised.

Morrill's greatest need, adequate school facilities, is soon to be satisfied. By a majority of more than two to one the citizens have voted a generous bond issue to provide for the immediate construction of a modern consolidated school. In the matter of good school facilities the reclamation project people are never stingy, and only the best will satisfy them.

Nevada, Newlands project.—Fallon folks are encouraged at the outlook for opening the sugar factory this season. Apparently the labor question has been settled by contracting for Mexican beet workers, and seed in abundance is on the way. Outlying districts are signing up a lot of acreage so that altogether everything looks bright.

What we would like to have said about the Newlands project has been so much better said by Friend Black, the editor, that we record it verbatim:

We of the Newlands project and Fallon its chief city have health, energy, perseverance, and the knowledge necessary to the achievement of success in our respective callings.

And we have opportunity as presented in the vast potential soil resources now latent in a great percentage of our irrigation project.

We have the power and initiative to accomplish whatever we undertake.

We have nearly 1,000 producing farms.

We have the State's only beet-sugar factory, idle several years and about to be set in motion again as a result of concert of action among the landowners of the valley.

We have homogeneity if we will only let it pursue a normal course.

We have a trading point probably unequaled, size considered, in the entire United States and at least two firms that each do an annual retail business in general merchandise of around \$1,000,000.

We have the best schools, best municipal improvements, best class of people, best community spirit, and best prospects for many years of healthy, normal, to-be-expected growth of any town anywhere.

We have a community trade balance that is larger than ever before and will be plethoric to an unusual degree when the call comes for our surplus farm production now awaiting this demand.

It will be pleasing news to most of the project farmers to learn that George Wingfield has decided to get into the dairy game again by importing a large number of high-grade milk cattle. It will not be forgotten that it was Wingfield who a number of years put life into dairying in Lahontan Valley. With commendable generosity he purchased a large number of California's good dairy stock and distributed them among the valley ranches, to be paid for out of the milk checks. In order to make a success of the enterprise he invested many thousands of dollars in rehabilitating and reconstructing a dilapidated creamery at Fallon, and finally put Fallon on the map as a producer of quality butter. During the period of high prices for hay many farmers gave up their herds. Now that the slump has come in all farm products, and particularly in hay and grain, these same farmers are regretting their mistake and are willing to go back to the sounder and more permanent industry of dairying. Lahontan Valley is an ideal country for dairying; there is no question as to that. It invites the progressive dairyman by offering land at reasonable prices, good markets for butter fat, and abundant and cheap food for stock.

New Mexico, Carlsbad project.—The gins on the Carlsbad project wound up their season's work with a total of 6,500 bales of cotton for 1920, most of which was shipped to the New Orleans market. But for the unfortunate drop in prices the project would have made a new record this season in both production and values. During the past four years Carlsbad farmers have made great progress in developing their ranches, and the present condition of their properties is in

striking contrast with that which prevailed when this was regarded as the paradise of the cowman. It is felt by everyone that the present depression is but temporary, and most of the people are looking forward bravely for the turn in the tide.

New Mexico-Texas, Rio Grande project.—There is always so much to commend in connection with the wonderful valleys of Elephant Butte that with limited space we are hard put to make selection of subjects. The outstanding feature of interest down in this romance land is the growth of cooperative enterprises. Of late we have been studying the analyses of farm conditions by experts, most of whom agree that our farmers have fallen down because in this age of specialization and competition in business the farmer alone is not organized. As one writer put it, "He is the only big producer in the country who after spending a whole year in getting his goods ready for market goes to his trade and asks, What will you give me for my product?" Other manufacturers fix the price of their commodities after careful consideration of costs and the market requirements. The farmer sows his seed, garners his crops, and takes what he can get for them. Without organization for marketing and with no standardization of his crops he is at the mercy of shrewd commission men who exploit him, and usually to his disadvantage.

Now, in the Rio Grande Valleys, watered by Elephant Butte Reservoir, the farmers are awake and stirring. Organizations for financing the members, for storing surplus crops, and for finding best markets and contracting for best prices are functioning in excellent shape. Spring time in these valleys finds these organizations apportioning areas for special crops, distributing selected seeds, instructing growers in preparation of land and methods of irrigating, and innumerable other activities. The market manager is looking up markets in advance after having made careful compilation of cost and estimated crop yields. Consideration is being given just now by a competent committee to the tax budgets, the work of the lawmakers in the State legislature, and the county officers. It's a forward-looking lot of men composed of practical farmers who are holding things in line down there near the border. Their work to date has been of signal value and usefulness, and beside its genuine benefit to the whole community in raising the standard of living and farming, it is of enormous value in preparing the farmers for the day now rapidly approaching when a \$15,000,000 public utility enterprise will be turned over to them for management. Experience gained in the operation of these lesser, but extremely important, industries is developing initiative and courage which will insure success in the larger fields soon to be opened for their efforts. We unhesitatingly and unqualifiedly recommend the Rio Grande project to the attention of practical farmers who wish to make homes in a valley where cooperation is the keynote of the daily life of the people.

where sunshine, soil, and abundant water lessen the risks of production and insure a larger measure of return for intelligent effort. There are opportunities in large numbers for farmers, and especially truck farmers, who can qualify, and there is a welcome awaiting them which will make them home folks as quickly as they can desire. To the wives of those farmers who are seeking a new home in the West we must say one word. In the Rio Grande valleys you will find the women's clubs are active and are delighted to extend a friendly hand to the stranger. They are doing much to make the life of the country women satisfying and sufficient, and their activities have the cordial support of the men.

A much needed institution in the valley, a packing plant, has been incorporated and will be established this spring in El Paso. The incorporation will slaughter, refrigerate, can, cure, and pack meats and meat products. El Paso is surrounded by an enormous area of excellent lands on which graze numberless flocks and herds. The irrigated valleys furnish abundant grain and forage for winter feeding and fattening. The market which now is supplied principally by Kansas City and Denver is a broad one, and should furnish ample support for this enterprise.

Washington, Yakima project.—At a recent and largely attended meeting held in Sunnyside the hay and potato growers put themselves squarely on record as favoring the adoption of grades. Hay is to be classified in two grades, and the grading rules are to be promulgated by the State only through its department of agriculture.

For potatoes three grades were recommended, the first to be called Washington Grade No. 1, the other as Nos. 2 and 3. The recommendations also define the character of each grade in specific terms and with the aim in view of building up a standard which should command the confidence of the public.

Stringent regulations to be enforced by State officers were recommended to be enacted into law for the protection of brands in marketing the crops.

H. E. Angell, of Mabton, president of the Yakima Guernsey Breeders Association, recently said:

These are the times that the farmers will turn to the cow and the hen to get that "extra" money which is so essential in the paying of his grocery bills. The dairymen of the community will soon realize the importance of the association, and the dairy industry will be built up.

Wyoming, Shoshone project.—Powell, the Government townsite and the focal center of the mercantile and financial interests of the project, continues to grow. At a recent sale of three town lots the purchaser bid in the property at \$1,469, which was just \$469 more than the appraised valuation.

Farmers on the project are about ready, it is said, to launch a new enterprise and one greatly needed in the shape of a \$20,000 flouring mill. The enterprise is to be entirely cooperative.—C. J. B.

The Reclamation Record.

Issued monthly by the Reclamation Service, Department of the Interior, under the authority of the Secretary of the Interior.

Copies of the RECLAMATION RECORD will be sent free of charge to any water user on our reclamation projects. The subscription price to others is 75 cents a year, payable in advance. Subscriptions may be forwarded to the chief clerk, United States Reclamation Service, Washington, D. C., and remittances (postal money order or New York draft) should be made payable to the special fiscal agent, United States Reclamation Service. Postage stamps will not be accepted.

Material for publication in the RECLAMATION RECORD should be addressed to *Editor*, United States Reclamation Service, Washington, D. C., and should be mailed in time to reach the editor not later than the 14th of the month, in order to insure publication in the succeeding month's issue of the RECORD.

HUGH A. BROWN, EDITOR.

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Reclamation Record.

[To be used only by persons who are NOT water users on the projects of the U. S. Reclamation Service.]

_____, 1921.

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DEAR SIR: I am NOT a water user on one of the projects of the U. S. Reclamation Service, but wish to receive the RECLAMATION RECORD each month.

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We are very glad to receive the RECLAMATION RECORD. It is admirably edited and contains matter of great value.—Dr. William O. Stillman, president, The American Humane Association, Albany, N. Y.



Dodder is Serious Pest if Remedies Are Delayed.

IF REMEDIES to exterminate dodder—the parasitic plant infesting clover, alfalfa, and some other plants—are applied before it gets a foothold, the pest does not cause serious damage. If, however, dodder is permitted to develop unmolested, radical measures will be necessary in order to control it.¹

During recent years an increase in the number of complaints of dodder have been received from all parts of the United States. The discovery of this parasite on the farm should not, however, be the occasion of serious alarm, but rather for the employment of a well-conceived and systematic plan for its extermination.

During the first season of infestation, in clover or alfalfa, dodder usually occurs in small scattered areas. As is the case in combating all weeds, it is essential that dodder should not be permitted to mature seed, and such small infested areas should be mowed and the dodder removed or burned in the field to prevent the development of seed. If seed has formed, burning the patches of dodder is the only remedy, since it kills not only the plants but also any seeds which may be lying on the surface of the soil.

If infestation is so great that patch treatment can not be depended upon, it will be necessary, in order to free the farm of the pest, either to plow the crop under or utilize it for hay before seed has formed. In the latter case, the aftermath left on the field should be closely grazed, for which purpose sheep are especially useful. If the infestation is general and threatens seriously to damage succeeding crops, it may be necessary to cut the crop, allow it to dry, and burn it in the field in order that all dodder seed may be destroyed.

As with all weeds, preventing introduction on the farm is far easier than eradication after it has once gained a foothold. It is usually introduced by the use of impure seed, and water users are urged to learn to distinguish dodder seed so that they can recognize it when they are purchasing clover and alfalfa seed. For adequate examination, a magnifying glass is necessary. There is a wide range in size of dodder seed, but in general they are usually dull-

coated with roughened or minutely pitted surfaces, and usually have two or three flat surfaces, whereas the seeds of clover are usually smooth, rounded, and possess a certain luster. Furthermore, the scar on dodder seed usually is very inconspicuous, whereas the scar on leguminous seeds is clearly evident. Their color ranges from dark-brown to green or yellow. Although it is possible to remove a large percentage of dodder by carefully cleaning impure clover and alfalfa by screening, it is practically impossible to remove large-seeded dodder by this process.

When animals are allowed to graze where dodder grows, they should not have access to fields not infested, since they are likely to spread the weed by means of pieces of stems adhering to their coats and hoofs. On land which contains the seeds of dodder, the use of a five-year cropping system is suggested, consisting of plants which are not damaged by the pest. The following plants are recommended: Corn, soy beans, velvet beans, cowpeas, and small grains such as oats, wheat, and rye. Sugar beets, onions, flax, and a few other cultivated plants are subject to dodder infestation, but clover and alfalfa are its important hosts.

Rules for Estimating Quantities of Produce in Bulk.¹

[All measurements in feet and tenths of a foot.]

To measure wheat, oats, barley, rye, buckwheat, and shelled corn in bins.—Multiply inside length and width of bin together, then multiply that product by the average depth of grain in the bin. This gives the cubic feet, which divided by 5 and multiplied by 4 gives approximately the number of bushels of grain.

To measure ear corn in bins or cribs.—For structures with perpendicular sides, multiply inside length and width together, then multiply that product by the average depth of the corn in the bin or crib. Where the crib or bin sides are flared or sloped the width must be determined by measuring both at floor and top of corn pile. Adding these two widths together and dividing by two gives the average width measurement, which in such cases is the correct one

¹ From Farmers' Bulletin 1182.

to use. Dividing the cubic feet by 5 and multiplying by 2 gives the approximate quantity in bushels of shelled corn. For corn in the shuck, divide by 7 and multiply by 2. Multiplying the cubic feet by 8 and pointing off two decimal places gives the approximate quantity in "barrels" of ear corn. A "barrel" of ear corn is equal to 5 bushels of shelled corn or 10 bushels of ear corn, and its legal weight is 350 pounds.

To measure hay, straw, and shredded stover in the mow.—Find the cubic feet by multiplying together the length, width, and average depth of the space occupied. The number of cubic feet in a ton will vary with the length of time the product has been stored. For inventorying purposes, figures based on storage for 5 months or more can be used. In general, it will be approximately accurate to use the following figures:

- To get tons of hay, divide cubic feet by 550.
- To get tons of straw, divide cubic feet by 625.
- To get tons of shredded stover, divide cubic feet by 675.

To measure ricks.—Measure the distance from the ground on one side over the rick to the ground on the other side. To this add width of rick at ground. Multiply that sum by itself and multiply the product by the average length of the stack. For hay that has been stacked 5 months or more divide this last product by 75 and point off two decimal places to get the approximate number of tons.

To measure stacks.—Round stacks of forage vary so greatly in the relative proportions of height and diameter, as well as in shape, that no approximately accurate simple rule can be given. In some parts of the country it is customary to put a certain average quantity of forage into each stack. Where this is done the quantities can be approximated by counting the number of stacks and multiplying by the average quantity per stack. A rule which will give fairly close figures for average-shaped stacks is to measure the vertical distance from ground to bulge, and add to this figure $\frac{1}{4}$ the vertical distance from bulge to top; multiply this sum by the circumference of the stack at the bulge and multiply the resulting product by the circumference at the ground. Dividing this last product by 12 will give the number of cubic feet, approximately. For hay in uncovered ricks and stacks the number of cubic feet in a ton will vary from 400 to 500.

Conversion of inches into tenths of a foot.

Inches.	Tenths of a foot.	Inches.	Tenths of a foot.
0 to $\frac{1}{2}$	0	$5\frac{1}{2}$ to $6\frac{1}{2}$	5
$\frac{1}{2}$ to $1\frac{1}{2}$	1	$6\frac{1}{2}$ to $7\frac{1}{2}$	6
$1\frac{1}{2}$ to $2\frac{1}{2}$	2	8 to 9	7
$2\frac{1}{2}$ to 4	3	$9\frac{1}{2}$ to 10	8
$4\frac{1}{2}$ to $5\frac{1}{2}$	4	$10\frac{1}{2}$ to $11\frac{1}{2}$	9

PREVENTING COSTLY DISEASES IN HOG RAISING.

By the U. S. Department of Agriculture.

THE hog is the most prolific animal raised on the farm, with the possible exception of poultry. Given a chance, the hog is one of the most profitable farm animals. The hog requires less labor, less equipment, less capital, and makes greater gains per hundred pounds of concentrates than any other farm animal. Farmers on reclamation projects are rapidly awakening to the merits of the hog, both as an independent animal industry and as a supplement to dairying and trucking.

By far the worst enemy of the hog breeder is hog cholera; next to this come tuberculosis, parasitic diseases, and a disease whose scientific name is necrobacillosis, and which generally is known in one form as sniffles and in another as necrotic enteritis. Against all these diseases the most effective measures are the preventive ones; the first step is sanitation, and the second is careful watching for symptoms and segregation of animals that show signs of contagious or infectious disease.

HOG CHOLERA.

Hog cholera is a highly contagious disease of swine which has destroyed as much as \$65,000,000 worth of stock in a single year. It is caused by a virus which is present in the blood, urine, feces, and the eye and nose secretions; it is accompanied by fever, has a high death rate, and, so far as known, does not affect other animals or man.

When cholera begins in a herd the hogs do not all become sick at once; but, on the contrary, only two or three will refuse to come up to feed with the herd. They will remain hidden in the nest, and when driven from the bed their backs may be arched and they may shiver and appear cold. The rest of the herd may remain apparently well for several days, when others are likely to be found affected in the same way as those first attacked. As the disease progresses the sick hogs become gaunt or tucked up in the flank, and have a weak, staggering gait, the weakness being most marked in the hind legs.

Various symptoms.—If the lungs are affected there may be a cough. The eyes usually are inflamed and show a whitish discharge, which may cause the lids to stick together.

Constipation, which is commonly present in the early days of the disease, is generally followed by a diarrhea. As the disease reaches its height, red or purplish blotches are likely to appear upon the skin of the ears, of the belly, and of the inner surfaces of the legs.

Some of these symptoms may be present in other diseases, but cholera spreads rapidly through a herd

and too much time should not be lost in undertaking to distinguish it from some other disease.

The temperature of the hogs is of much importance in diagnosing cholera. The normal temperature in ordinary weather when the hogs are not excited or worried will range from 101° to 104° F., but when cholera is present it is not uncommon to find a large proportion of the hogs with temperatures from 104° to 107°, and even higher.

Examination of carcasses of hogs that die will assist in determining whether they died of cholera. Briefly, the important things to be looked for are:

Purple blotches on the skin resembling birthmarks.

Blood-colored spots on the lungs, on the surface of the heart, on the kidneys, and on the outer surface and inner lining of the intestines and the stomach.

Reddening of the lymphatic glands.

Enlargement of the spleen, in acute cases.

Ulceration of the inner lining of the large intestine.

Any one or all of these changes may be found in a hog which has died of cholera. It is rare to find all in any one case. In the lingering or chronic cases of hog cholera, it is usual to find intestinal button-like ulcers, while the blood-colored spots are, as a rule, found only in acute cases.

So far as known, hog-cholera virus develops only in the bodies of hogs. There is no more certain way of introducing hog cholera than by placing in the herd a hog already infected with the disease. Hogs affected with cholera discharge the virus of the disease from their bodies in the urine, the feces, and the secretions of the nose and eyes. Therefore, the manure, bedding, litter of all sorts, and the dirt itself in pens where sick hogs are kept contain the virus of the disease. This may enter the hog's system by means of food or drink and probably also through wounds or abrasion of the skin.

Means of protection.—To assist the farmer in protecting himself, the following suggestions are offered: Hog houses, lots, and pastures should be located away from streams and public highways, and the houses and lots should be arranged so that they may be cleaned and disinfected readily. They should be exposed as far as possible to sunlight, which is the cheapest and one of the best disinfectants. Hog lots should not be used for yarding wagons and farm implements and should not be entered with team and wagon, particularly when loading stock for shipment to market and when returning from stockyards and public highways. No one should be allowed to enter hog lots unless there is assurance that he does not carry infection. Farmers and their help should disinfect their shoes before entering hog lots after returning from public yards, sales, and neighboring farms.

Wallow holes and cesspools should be drained, filled in, or fenced off.

Runs underneath buildings should be cleaned, disinfected, and boarded up. Straw stacks frequented by sick hogs should be burned or removed to the field and plowed under.

Hogs that do not recover fully from cholera should be destroyed.

All animals that die on the farm, as well as the entrails removed at butchering time, should be burned or buried with quicklime away from streams and low places. Unless disposed of in this way they will serve to attract buzzards, crows, and dogs that may bring or carry away the virus of hog cholera.

Stock newly purchased, borrowed or lent for breeding purposes, or exhibited at public fairs should be placed in isolated pens for at least 15 days before being turned in with the herd.

Hogs should not be allowed to follow newly-purchased stock that has not been dipped or driven through a suitable disinfectant.

If hog cholera appears on the farm a notice should be posted at the entrance to the premises reading "HOG CHOLERA—KEEP OUT," and all neighbors should be warned so they can protect their herds. The infected herd should be confined to limited quarters that can be cleaned daily during the presence of the disease and sprayed occasionally with a disinfectant consisting of 1 part compound cresol solution to 30 parts water, or with a recognized substitute.

No drug is known that can be regarded as a preventive or cure for hog cholera. Only one agent known can be regarded as a reliable preventive. It is called "anti-hog-cholera serum" and is prepared according to the methods originally worked out by the Bureau of Animal Industry. The method of preparing this serum and of administering it efficiently are given in Farmers' Bulletin 834, which may be had on application to the United States Department of Agriculture, Washington, D. C.

It is best, when any symptoms of possible hog cholera appear, to call in a veterinarian and to communicate immediately with the State veterinary authorities or the United States Department of Agriculture. Your county agent will help you to get in touch with the authorities and to administer such first-aid treatment as is practicable.

OTHER HOG DISEASES.

A few diseases of hogs at times may be mistaken for hog cholera. These are swine plague, tuberculosis, anthrax, necrobacillosis, and lung and bowel disturbances due to worms.

Swine plague or pig pneumonia is so much like hog cholera in its symptoms that even skilled veterinarians may find it almost impossible to distinguish one from the other. It is best for the farmer to treat suspected swine plague just as he would a case of cholera.

Tuberculosis is also sometimes confused with hog cholera. One distinguishing feature is that the onset and progress of tuberculosis are rather slower. The disease is most commonly conveyed by feeding hogs on unpasteurized skim milk and by allowing them to follow tuberculous cattle. Prevention lies in the pasteurization of milk fed to hogs, in allowing hogs to feed only behind such cattle as have passed the tuberculin test, and in thoroughly cooking all garbage, offal, or carcasses fed to hogs.

When tuberculosis exists in a drove of hogs all affected animals should be removed from the premises. Detailed information can be obtained from Farmers' Bulletin 781.

Necrobacillosis may appear in various forms. One is a condition commonly called "sniffles" or "bull nose." Another and most important form is called necrotic enteritis, characterized by a severe inflammation of the intestines, and at times may be mistaken for cholera. Often there is a lack of appetite, and while diarrhea is not constant it frequently is seen in the early stage of this disease. The pigs become unthrifty, emaciated, and weak.

Sanitation basis of prevention.—The keynote of prevention in this also is proper sanitation of premises. Frequent and thorough cleaning out of pens, troughs, feeding floors, sheds, and hog lots is an important factor of preventive measures. In addition to thorough cleaning at frequent intervals, a liberal quantity of lime should be applied in pens, houses, and adjoining lots. Proper care in feeding will also eliminate much of this trouble.

EXTERNAL PARASITES.

Lice and mange mites are the two principal external parasites affecting hogs, causing the greatest losses in pigs and poorly nourished hogs kept in insanitary quarters. Lice can be eradicated by hand applications, spraying, medicated hog wallows, and dipping, which is the best method of applying treatment. Crude petroleum and coal-tar creosote dips are effective remedies.

Two species of mange mites commonly affect hogs. The nature and habits of these mites, the symptoms caused by each species, and the methods of control and eradication are discussed in Farmers' Bulletin 1085, issued by the United States Department of Agriculture, which also contains plans of hog wallows and dipping plants, together with directions for building them and their use in the treatment of hogs for lice and mange.

CHANGES IN PROJECT MANAGERS.

W. W. Schlecht, project manager of the Yuma project, resigned, effective February 1, and was succeeded by P. J. Preston, project manager of the Uncompahgre project, who in turn was succeeded by L. J. Foster, office engineer, Denver office.

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RECLAMATION ABROAD.

San Luis Potosi, Mexico.

In the budget submitted by the department of agriculture in Mexico, 25,000,000 pesos have been requested for irrigation work. Several projects are under contemplation in San Luis Potosi. It has been decided to grant a concession for the construction of a dam large enough to impound 243,000 acre-feet of water to be used for irrigation purposes in the municipality of Rio Verde, and it is understood that another group of engineers is negotiating with the Secretaria de Fomento for a concession to construct a dam to irrigate the valley of Cerritos, one of the richest agricultural sections of the State of San Luis Potosi.—*Commerce Reports.*

Siam.

Dredging machinery to the value of \$65,495 was imported from the United States during 1919-20, and several American engineers are at work on an irrigation project, by which the Government expects to greatly increase the rice production of the country and possibly provide for the growing of a variety of other crops. Information as to the time when water will be obtainable for irrigation purposes is not yet available, as the work has been delayed owing to the difficulty of getting steelwork from abroad.—*Commerce Reports.*

Pampas Imperial Project, Peru.

Construction work was begun in July, 1920, on the Pampas Imperial irrigation project in the Canete Valley, about 85 miles south of Lima, and if the present rate of progress is maintained the undertaking will be completed in the early part of 1922 and 20,000 acres of new land will be brought under cultivation. The project was authorized by the Peruvian Government on May 7, 1920, and is being constructed under the direction of an American engineer.—*Commerce Reports.*

BULLETINS FOR THE FARMER.

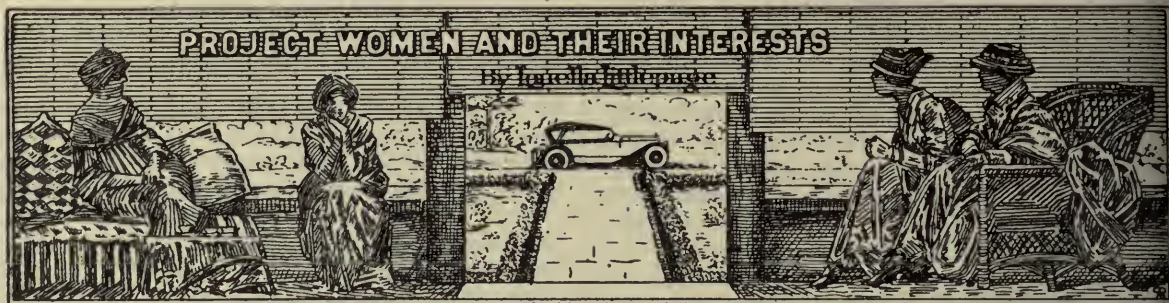
Distributed by the Department of Agriculture,
Washington, D. C.

FARMERS' BULLETINS.

No.

- 1136. Baking in the home.
- 1150. Parasites and parasitic diseases of sheep.
- 1159. Fermented pickles.
- 1161. Dodder.
- 1185. Spraying for the alfalfa weevil.

You are your best asset. Capitalize yourself. Buy War Savings Stamps.



DID ever a woman live, I wonder, who didn't occasionally "spend a million dollars"? It is my favorite pastime. Try it sometime when things all go wrong, as things sometimes will. First, of course, you'll put a certain amount in Government bonds or some other gilt-edged security 'gainst a rainy day. Then you'll make wonderful gifts to the people you love. Perhaps you'll take a trip to Europe or the Orient, and, of course, you'll buy clothes and jewels and a Rolls-Royce.

But whatever else you do, you'll end up by building a house. Nine times out of ten it will be a cozy, unpretentious house, because, you see, it is only in fancy you have spent a million dollars, but the home of your dreams has been always with you, too close, too intimate a thing, and too devoutly longed for to treat as flippantly as most of the things you buy with the air-castle million.

In the heart of every woman there is a dream of a home, and in the hands of every farm woman are the "makings." The city woman may be handicapped by lack of funds, which are her only assets, but to the farm woman money is not vitally needed. She has some kind of a house; she has the ground; and with the magic of fresh air and sunshine and the love of home her hands can work miracles.

Now most farm homes, except the older established farmsteads, are simply places to live until some mythical fortune is made, but it is surprising how these temporary homes can be improved "while you wait," and at little or no expense.

Walk down the road a piece first in one direction and then in another, and as you return view your house with critical, stranger eyes. What kind of people, think you, live here? Are they the trashy, careless, colorless sort, or the kind you like to know? What of the outposts of this home—the gateways? Are they saggy and careless, stiff and forbidding, or do they frame welcome vistas to an attractive little house beyond?

Look to your gateways, and if you don't get any farther during the whole year, fashion them more nearly to your liking, for they give to the stranger his first impression of the place and its occupants. Study magazine pictures and select for your pattern the improvements which will best fit in with your individual

surroundings. Simple treatment is the most effective, and vines, flowers, shrubbery, and arches are all easily obtained.

Are there unsightly banks eroded by wind and water, along the roadway approaching your home yard? Honeysuckle or any native wild clinging vine can be made to cover them with a beautiful mantle.

Be sure to leave wide, restful spaces of lawn unspoiled by too much planting, but let shrubs and vines and flowers hide unattractive foundations and soften the outline of porch and wing.

March is the ideal month for planning. From the standpoint of household economy it contains the most precious four weeks of the entire year. It is now the wise woman plans her home improvements, her sewing, her garden, her canning and preserving, vacations and recreation, how to cut out all lost motion and make her home efficient and beautiful, and a little nearer her heart's desire.

The Work Shop.

The kitchen is the workshop in most homes. In it the housekeeper and her helpers prepare the food for the family, and from it as a center carry on most of the other housework.

More and better work can be done in a well-lighted shop arranged for the comfort and convenience of the workers and equipped with good tools than in a dark shop where much time must be spent in unnecessary steps and energy wasted with scattered equipment.

Business men have found this a sound principle, and it should be applied to the farm kitchen, so that the housekeeper can do her work more quickly and with the least amount of energy expended.

Any Farm Can Do It.

No less an authority than Herbert Quick says that any farm that can afford a silo can afford a bathroom and a septic-tank sewage disposal system. Any farm that can afford a cream separator can afford a washing machine. Any farm that can support pumping and storage facilities for the live stock can afford running water, hot and cold, in the house. Any farm that can maintain a manure spreader can afford an acetylene, gasoline, blaugas, or electric lighting sys-

tem. Any farm that can afford self-feeders for the cattle can afford vacuum cleaners and electric work-saving devices for the women. Any farm that can justify binders, silage cutters, shredders, side-delivery rakes, corn harvesters, potato planters, and finely equipped barns can afford every modern convenience for making the home a good place for women to live, work, rear children, and develop in them the love for farm life.

And he might have added that it is usually the fault of the women when these conveniences do not keep pace. They fancy that just so far as they can avoid expense they are helping their husbands. It is poor economy.

Hot Dishes for the School Lunch.

Rural teachers who are often called upon to cook meals for the entire school may sometimes be perplexed by the problem of what she shall make for the hot noon lunch, which has now become an essential in the modern school, particularly in the modern country school which draws pupils from a considerable distance.

The hot-lunch movement is thoroughly organized in the Yakima County schools, Washington. The Yakima city pupils may have their hot morning drink of milk, but the youngsters in the remote country district nearly always have a hot soup or some other warm dish to eat with their sandwiches and other viands which they have brought from home. Where there are advanced pupils the students themselves often cook the hot dish which is served at noon, but in many cases the teacher must do so, and from the Yakima project come some tried and tested recipes which will be found useful.

Potato soup.—For 25 children—3 pints of diced raw potatoes and one-third of a pint of onions in 3 quarts of cold water are prepared before school and put on in the 12-quart kettle at recess, 10.15 a. m. At 11.30 a gallon of whole milk, 2 ounces of good butter, salt and pepper are added and the fire turned low.

Bean soup.—Bean soup requires 2 pounds of navy beans and one-half pound of salt pork. Soak the beans over night and put on to boil in fresh water with the meat early in the morning.

Vegetable soup.—Prepare the vegetables the night before or before school in the morning and have them standing in cold water. A 15-cent soup bone, a few carrots diced, celery leaves, a little chopped cabbage, and a few diced potatoes may be put into the big kettle with 7 or 8 quarts of water before school. At recess put in a pint of tomatoes and half a cup of rice and pepper and salt.

Rice boiled in milk.—Two pounds of rice washed and put on at recess in 3 quarts of water, boiled until half past eleven, when 1 quart of whole morning's milk, 2 ounces of butter, and salt are added. If meat is not added sugar and a little cinnamon may be served. Rice sticks to the kettle, so a "trusty" must be asked to watch it. Rice and macaroni are the only dishes that need this care and are worth the effort, which is really very little.

Cocoa.—For cocoa, 3 quarts of milk, 2 quarts of water, 4 ounces of sugar, and 4 ounces of cocoa are used. At recess heat a little water and make a cocoa paste with the

cocoa, hot water, and sugar. At 11.15 an older pupil sets the kettle containing milk and water on the fire with flame medium. At 11.45 the cocoa paste is turned into the big kettle.

Beef and vegetable stew.—Two pounds of beef cut rather small, with a little fat and a bone or two for flavor, 1 quart of carrots cut in coarse pieces, 1 pint of sliced onions, 2 quarts of diced potatoes, a little flour, and 5 quarts of water. Put beef and water on early in the morning. At recess put in all the vegetables and stir up the flour thickening. At 11.45 stir in the thickening, add salt and pepper, and turn down the fire.

Macaroni creamed with cheese.—Three pounds of macaroni is put on in 4 quarts of cold water at recess. One quart of milk, and cheese, salt, and pepper, and 2 ounces of butter are added at 11.45.

Women's Club Work.

The clubwomen of Yakima, Wash., are following a home industries demonstration by further interest in State industrial products. They are making a special point of buying articles produced at home. This has a twofold effect—of stimulating interest in State manufactures and in cutting down expenses. Freight rates bulk large these days in the cost of anything that comes from afar, and articles which do not have to contend with long distance haul can naturally be put on the market for less than the imported stuff. There are several garment factories in the State of Washington, and overalls, shirts, aprons, and other articles of standard quality can be obtained by the women of Yakima practically "at home." The Yakima Commercial Club has an annual "Home demonstration week," and the women are cooperating very effectively.

The Yakima women's clubs have united in promoting the regular use of the budget system in the household, and are urging everyone with financial problems to secure one of two booklets which are being distributed at banks and at the Y. M. C. A. and Y. W. C. A. headquarters. The larger budget book is designed for the use of families and a smaller one for single men and women.

The books begin with the 10 financial commandments:

1. Work and earn.
2. Make a budget.
3. Record expenditures.
4. Have a bank account.
5. Carry life insurance.
6. Own your own home.
7. Make a will.
8. Pay all your bills promptly.
9. Invest in reliable securities.
10. Share with others.

One of the club women said in discussing the budget system in the household that salaried people can most easily put it into effect, whereas people like ranchers or professional men, whose income varies from month to month, can not estimate so carefully in advance.

But even they can reach an approximate estimate with a little effort, and the value in clearing up financial difficulties and eliminating useless expenses will far more than repay the trouble.

At the insistence of the club women of Yakima, Wash., Mrs. Jessie J. Persels was appointed food inspector more than a year ago, and it is said that when her report for the year 1920 was turned in the powers that be were extremely gratified over the results. Her report shows that she made 4,170 official calls during the year, and that 10 cases involving violations of the food laws were taken into court and convictions obtained in each case. Thirty-two show cases and 23 cheese cases were installed in local stores at her request, and 26 ice boxes were enameled

or replaced by new ones; many chipped and cracked dishes in public places were condemned and destroyed. Sixty-three notices to clean up premises were issued and complied with. The inspections included bakeries, candy factories, soda fountains, grocery stores, restaurants and cafes, and fruit and vegetable stands. Almost 3,000 cans of food preparations were condemned by Mrs. Persels, as well as 156 bottles and jars of food and 636 pounds of articles in bulk. Yakima and all the country 'round about have reason to be thankful.

The Deaver Women's Club, Shoshone project, Wyoming, recently gave a dance and donated the proceeds toward a manual-training department in their school.

Reclamation Record Cook Book.

HONEY CARAMELS.

(By Mrs. Gordon Miller, Yakima project, Wash.)

Equal quantities of strained honey and cream, pinch of salt. Cook to the soft ball stage, beat and add flavoring. Cool and cut in squares. These can be varied by adding nuts, chocolate, and different flavorings.

HONEY GRAHAM PUDDING.

(By Mrs. Gordon Miller, Yakima project, Wash.)

1 cup strained honey.	1 cup raisins.
2 cups graham flour.	2 level teaspoonfuls soda.
1 cup sweet milk.	Salt.

Steam three hours.

Sauce.

1 egg well beaten.	3 cup sugar.
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Beat until light and creamy. Just before serving add 4 tablespoons hot water and flavoring.

MAPLE CARAMEL CUSTARD.

(By Mrs. J. C. Gawler, Yakima project, Wash.)

1 cup sugar.	1 teaspoon mapleine.
3 cup butter.	Chopped nuts.
1 pint milk.	
2 rounded tablespoons cornstarch.	

Melt the butter and sugar. Blend the cornstarch and milk. When butter and sugar are thoroughly melted, add milk and cornstarch and stir constantly until it thickens. Add mapleine and nuts. Chill thoroughly and serve in tall sherbet glasses, and pile up with whipped cream.

Mrs. Gawler, at one time connected with the Washington Office, and later with the project office at Yakima, has recently been appointed for the second time chairman of the home economics division of the applied education department of the General Federation of Women's Clubs.

TOMATO CATSUP.

(By Miss Amie L. Mook, clerk, Yamika project, Wash.)

1 gallon tomatoes.	2 large onions.
5 tablespoons salt.	

Boil all together and put through colander, then add:

1 quart of vinegar.	2 teaspoonfuls black pepper.
1 teaspoonful allspice.	1 teaspoonful red pepper.
3 teaspoonful cloves.	1 teaspoonful mustard.
1 teaspoonful cinnamon.	1 cup sugar.

Tie spices in bag. Boil all four hours. Half the amount of vinegar is preferred by some.

MARSHMALLOWS.

(By R. E. Morton, purchasing agent, Yakima project, Wash.)

2 cups granulated sugar.	1 1/2 cups water.
1 envelope Knox's sparkling gelatin.	1 pinch salt.

Put half of water on gelatin and allow to soak for five minutes.

Add other half of water to sugar.

Boil sugar and water until it forms soft ball when dropped in cold water. Remove from fire, add gelatin and flavoring, and set to cool.

When cold, beat with Dover egg beater until very light and fluffy.

Pour in pan that has been dusted with powdered sugar; let stand until stiff, then cut in squares and roll in powdered sugar or shredded coconut.

FILLED COOKIES.

(By Helen Ward, clerk, mails and files section, Washington office.)

3/4 cup shortening.	1 cup sugar.
1 egg.	3/4 cup milk.
1 teaspoonful vanilla.	3 1/2 cups flour.
4 teaspoons baking powder.	2 teaspoonful salt.

Filling.

1/2 cup chopped raisins.	1/2 cup chopped figs.
1/2 cup sugar.	1/2 cup water.
2 teaspoons flour.	

WHITE CAKE.

(By R. E. Morton, purchasing agent, Yakima project.)

All level measurements:

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| 1 cupful butter. | 3 cups cake flour. |
| 1½ cups granulated sugar. | ½ teaspoon vanilla extract. |
| 4 teaspoons baking powder. | ¼ teaspoon almond extract. |
| 1 cup milk. | 4 egg whites. |

Cream butter, add sugar gradually. Sift flour once, then measure, and add baking powder, sifting four times. Add flour and milk alternately to first mixture, add flavoring, and beat the batter hard. Fold in the egg whites which have been beaten stiff.

WASHINGTON CAKE.

(By Alva M. Schenken, stenographic section, Washington office.)

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|---------------------|----------------------------|
| 1 cup butter. | 1 cup seeded raisins. |
| 3 cups brown sugar. | 2 teaspoons baking powder. |
| 1 cup milk. | 1 teaspoon cinnamon. |
| 3 cups flour. | ½ teaspoon nutmeg. |
| 4 eggs. | |

Cream butter and add sugar and well-beaten yolks of eggs. Add flour, with which the baking powder has been sifted, alternating with the milk. Beat well and add raisins, spices, and whites of egg. Bake in slow oven.

SIMPLE SPONGE CAKE.

(By D. H. Sibbett, land and contracts division, Washington office.)

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| 2½ cups flour. | 3 eggs. |
| ¼ teaspoonful salt. | 1½ cups sugar. |
| 2 rounding teaspoonfuls baking powder. | ½ cup cold water. |
| | Lemon flavoring. |

Sift baking powder with flour and salt. Beat eggs well and then beat in the sugar. Pour eggs and sugar into flour, also water and flavoring. Beat hard four minutes and pour into greased tins. Heat oven well for five minutes, but bake on upper grate with flame turned rather low for one-half to three-fourths of an hour. Nearly fills two bread tins.

GOOD PLAIN CAKE.

(By Mrs. Annie B. Cushman, stenographer to chief clerk, Washington office.)

One heaping cup of sugar; two heaping tablespoonfuls butter. Beat well together. Beat two eggs and put in with sugar and butter, and add two heaping cups flour and three teaspoons baking powder sifted together three times. Add cup of milk and flavoring. Bake in tins greased with lard and dusted with flour.

CARAMEL PIE.

(By Mrs. S. H. Fort, Newlands project, Nevada.)

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| 4 eggs. | 1 cup sugar. |
| 1 cup jelly. | 1 teaspoon vanilla. |

Bake in one crust.

CREAM PUFFS.

(By Mrs. E. Cushman, Newlands project, Nevada.)

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| ½ cup butter. | 1 cup boiling water. |
| 1 cup flour. | 4 eggs. |

Put the butter in the water, and see that it boils. Stir flour in boiling water until the mass leaves sides of dish. Let cool; beat in eggs, one at a time, until all is light. Drop on buttered dish and bake about 15 minutes. When cool split and fill with whipped cream.

OATMEAL COOKIES.

(By Mrs. T. E. Van Dreillers, Newlands project, Nevada.)

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|------------------|-----------------------------|
| 1 cup sugar. | 1 cup raisins. |
| ½ cup butter. | 2 cups oatmeal. |
| 3 eggs. | 2 cups flour. |
| ½ cup milk. | 1 teaspoon each of cinnamon |
| 1 teaspoon soda. | and nutmeg. |

Drop in buttered pan and bake in quick oven.

Full Measure for Full Price.

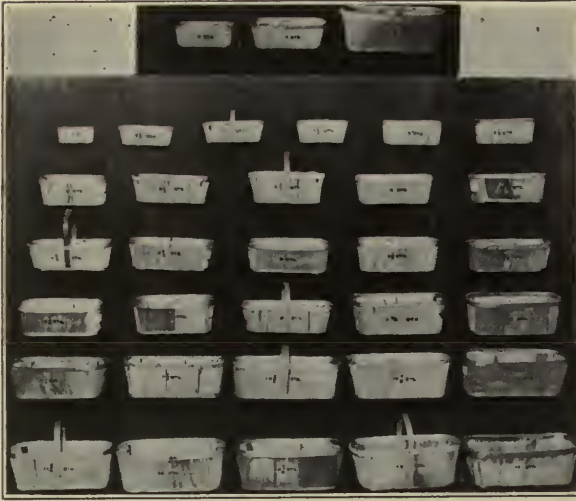
By Caroline B. Sherman, Scientific Assistant, Bureau of Markets, U. S. Department of Agriculture.

Some years ago when traveling in the West I was approached several times, in widely separated places, by women who knew I represented the Government Department of Agriculture with the query as to whether anything could be done to eliminate the nuisance of "snide" berry and fruit boxes. Frequently when they emptied out a berry box, they complained, they found the bottom set high into the box and similar practices deprived them of their rightful due of other small fruits.

I have often wondered if these same women realized that a few years later Congress actually did pass a standard-container law which prescribed the sizes for baskets and boxes for small fruits and vegetables in interstate trade so that no more deceptive bottoms and sides can rob us of the berries and grapes we think we have bought. By this law more than a dozen sizes of grape baskets were reduced to 3 and more than 33 styles of berry boxes and till baskets were replaced by 4.

And now I am wondering if these same women realize that another bill is now pending in Congress (H. R. 12350) which is designed to standardize hampers, round-stave baskets, and market or splint baskets. We now have about 50 styles and sizes of hampers in our markets instead of the five sizes that this proposed law says is ample. Nowadays when we buy a hamper of beans we do not know whether we are getting a full bushel or seven-eighths of a bushel. We usually pay the same price regardless of the size of

the so-called bushel hamper, and few are the housewives who can detect the difference without laboriously measuring them out quart by quart.



BEFORE AND AFTER.

Above: Sizes of grape baskets in use since the passage of the Standard Container Act. Below: Some of the grape baskets in use before the passage of the act.

The round-stave basket is not much used in the Far West, but is popular in other regions; in fact, some 18,000,000 or 20,000,000 are manufactured annually. Five sizes are all that are needed, although more than 20 are now in use.

Market baskets are used in selling many commodities on some markets, and they vary widely in capacity as well as in style. It is even more difficult to detect their discrepancies by eye than in the case of the hampers. The proposed law says that five sizes will fill all our needs—and will fill them honestly. More than five styles are allowed, but they must conform to these sizes in capacity.

These suggested sizes and styles are not arrived at in any haphazard manner. They are the result of many investigations and tests, usually conducted by the Government Bureau of Markets, and the results are approved by the best elements among the shippers, the trade, and the manufacturers of the containers before they are used in legislation.

And be it said to the credit of our good American citizens that the standard sizes, once set, have met with almost universal favor. The work of enforcing the standard container law has been largely a work of education. If these new standards are passed they, too, will doubtless be received as well. Why, then, are they not adopted voluntarily? Because, after all, we are all human, I suppose, and we seldom break ourselves of our own bad habits.

It is especially appropriate that the West should take an active interest in the standardization of containers for farm products for it has long maintained high standards for its fruits. In fact, it is through standardization largely that the apples of the Northwest and the citrus fruits of California have entered the markets of the world.

Diary of a Western Boy in Europe—(Continued).

By William E. Smythe, Jr.

V. SEEING RURAL ENGLAND FROM A BICYCLE.

RISEING the next morning at 7.30, I found that the sun was already dispelling the mists from the channel and Dover Castle could be discerned through the parting fog. The castle looked as old as the rocks around it, but it looked as strong and firm. It seemed to represent the spirit of England—gaunt, rugged, unshaken by the elements.

After a substantial breakfast in the coffee room of the Paris Hotel I again set out on my travels. This time I mounted my bicycle and started for Canterbury and South Woodford. Leaving Dover, I climbed up into the hills, where a Scotch mist made the leaves fresh and the air fragrant. The harvest had been taken in and the fields were bare, save where some wild plants remained. A few old farmhouses nestled in the ravines and now and then a queer windmill could be seen on some higher knoll, but for the most part those Kentish Hills were uninhabited.

I might compare them to the Yorkshire Hills which I crossed the previous month on my way to Hull. The latter were steeper, more rugged, and were covered everywhere with black towers that marked the shafts of coal mines. Picturesque stone cottages with thatched roofs seemed to fit into the landscape as if they had grown there. I passed numerous towns of brick houses, built on sidehills which were almost perpendicular. All of the children, and many of the adults, wore wooden shoes, and when a crowd of them ran along the cobblestone streets it sounded much like a stampede of Shetland ponies.

Stopping at a grocery store for a drink of lemon soda, I was surprised to see a showcase full of American flags and transfer stamps. Over the case was the sign: "Wear the emblem of our newest ally."

Again taking the road, I passed numerous buses which ran over the beautiful highway from Dover to Canterbury. At 11.30, I entered the famous city of Canterbury, and went immediately to the cathedral. It looked far older to me than either Westminster or Notre Dame. One of the most beautiful things about it is an immense rose window. After visiting the cathedral, I went to a little tea room and had a delicious lunch. Passing through the old West Gate, I again took the open road.

Here I found the land less hilly, and after traveling for a while I found myself in fields of trellised hops. For miles I passed by rows of green vines. I compared this country to that between London and Liverpool where the smooth highways were hedge-bordered and the crops were flat. The villages, for the most part, looked as though they were built to receive the benefits derived from a good highway. In other words, they were modern; but some there were—such as Bunchurch, Horncchurch, Chalfont St. Giles, and Chalfont St. Peters, that looked as old as England itself.

As I pedaled on toward Chatham and Gravesend, I thought of my earlier trip to Chalfont St. Giles. On that occasion I took the Metropolitan about 30 miles out of London to a small town, where I got off and found a track leading through a wood. This I followed over many a stile and across several fields until I came to the Pheasant Inn, where I obtained a mug of cider, and where I learned that the tracks such as I had just been over were as much public property as the roads. Many of them are old church paths, and are held sacred for that reason. They had once been used to transport to church coffins slung between two donkeys. I was told that a foreigner had bought one of the near-by estates and plowed up the sacred paths which crossed his land. First he was kindly asked to replace the time-honored tracks, which he refused to do, and after a few days he awoke to find his hedges leveled and his garden trampled. The tracks were subsequently replaced.

Leaving the Pheasant Inn I walked on into the town of Chalfont St. Giles. It is a typical old English town. It has its green, its high street, and its pond. The houses are built to a large extent of stone, and the rooms are low celled. The tea room vies for supremacy with the public house. The church is constructed of tiny pieces of slate, and the grass grows tall between the stones in the old kirkyard. Although so near to London, it is one of those blessed forgotten places that the automobile has yet to spoil. Geese and chickens wander undisturbed down the principal street, and childish laughter or the jingle of a bicycle bell are the loudest sounds to be heard.

At one end of the town stands an humble cottage, which was the birthplace and early home of Milton, the immortal poet.

Leaving the village by another well-worn track, I crossed a field where large, red English poppies grew amongst the ripening grain. Over the hill I came to the little town of Jordan—the home of the Quakers. There, in the shade of great oak trees, in the green yard of the meeting house, lie the remains of William Penn.

Making a circuit through Chalfont St. Peters, I came out at Chawleigh Wood Station, just as the shadows were lengthening and the fields were turning to gold, at the touch of the setting sun.

And so, as I thought of that trip, I passed through the busy city of Chatham, and came to Gravesend just as the chimes were striking six. I asked a newsboy the way to Tilbury Ferry, and was told to take the first turn to the right and go straight down the hill. This I did, and found myself on board the little ferry almost before I realized it. The boat pulled out into the muddy Thames, and I was soon landed on the Essex shore.

I pedaled on in the dusk, against a head wind. Soon I passed through the town of Grays, with its well-kept streets, and on into the country. It was dark, and the chimes on the old church were striking 9, when I rode into Horncchurch. I went into every "pub" in the town, but could find neither board nor lodging for the night. By that time I was completely tired out, and about ready to sleep in the nearest field, but decided to go on to Romford. I lost my way several times, and my light went out, but I finally came into the streets of Romford. Several men and boys shouted at me to carry a light; but I paid no attention until I was stopped by a policeman, who said he ought to run me in for going without a light. I was so completely fagged out that I only said: "I wish you would run me in, I don't care where I go, if I can only go to sleep." He took pity on me, however, and conducted me to an inn, where I was able to procure a hot supper and a room; so at last I tumbled into bed, a weary wayfarer indeed, after covering 76 miles on my cycle that day.

(To be continued.)

—L. L.

SOUTH AFRICAN ENGINEER TO BE ASSIGNED TO RECLAMATION SERVICE.

Secretary Payne is in receipt of the following cablegram from the director of irrigation, Pretoria, South Africa:

"Union Government, South Africa, anxious to get your authority to post assistant engineer, irrigation department, for one year's experience on construction works, United States Reclamation Service. Intention is young officer this Service to gain technical experience in actual construction. Appointment will be scholarship from this Government and Reclamation Service will be put to no expense. Desire him to go from work to work under construction to study designs, methods, and application. Kindly cable reply as anxious to send him at once."

To which Secretary Payne replied as follows:

"Assignment irrigation officer is authorized with pleasure."

The Reclamation Service welcomes this opportunity to cooperate with the irrigation department of South Africa in extending the benefits of irrigation development to the far corners of the earth.

EDUCATIONAL ADVANTAGES ON THE LOWER YELLOWSTONE PROJECT, MONT.

By L. H. Mitchell, Project Manager, U. S. R. S.

THE readers of the RECLAMATION RECORD, especially those who were informed last summer through articles in magazines and newspapers based on statistics compiled by the Russell Sage Foundation, that Montana had the best all-round public school system in the United States, may be interested in learning that educational advantages on the Lower Yellowstone project of the Federal Government can not be excelled in many farming communities of the country.

At Intake, or where the water for the Lower Yellowstone project is diverted from the Yellowstone River, there was constructed recently a modern school building, shown in the accompanying illustration.

Savage, where the headquarters of the United States Reclamation Service are located, has one of the best school libraries and apparatus for teaching physical geography and general science. There is a good three-year accredited high school. The system of grade work and corps of teachers would be a credit to a city of several thousand. The illustration shows many smiling faces of this school.

About 6 miles down the valley from Savage is the new \$6,000 Midway school building, illustrated herewith, with its cement basement used for playroom and domestic science. This building has a library and large cloakroom and is considered the best rural schoolhouse in eastern Montana. The two teachers of this school are furnished with a comfortable modern cottage. Nothing is omitted to make school life and work attractive for the teachers and pupils.

The illustration shows the excellent two-room school building at Crane, with its fine library and playground equipment.

Since the photographs of the school buildings of the project were taken there has been constructed about halfway between Crane and Newlon a one-room building. The walls are tinted; the basement has a playroom and hot-lunch room.

At Newlon there is a finely equipped two-room building, shown in the illustration. The flowing well, large playground, and teachers' cottages here are a credit to any rural school.

Sidney, the county seat of Richland County, has a school that ranks among the best in Montana. In addition to the regular high school and grade teaching work, there is an agricultural department operated under the Smith-Hughes Act. During the winter there is a farmers' short course. The school is equipped with a moving-picture outfit which shows the pupils and patrons various travel scenes, agriculture views, and classics in English. This school building, illustrated herewith, is Sidney's best monument. Arrangements were made by the county super-

intendent of schools, Mrs. Emogene Lectra, for a six weeks' summer term for the children engaged in farming beets. The illustration shows the average attendance.

Between Sidney and Fairview are two small rural schools. At the time the accompanying photographs were taken of these the enrollment was small, as many children were engaged in harvesting beets.

Fairview has the most complete consolidated district in the county. It has one of the best 4-year high-school courses. During the past two years this school has graduated over a dozen that are now following the teaching profession. Count the faces in the picture.

At East Fairview, N. Dak., there is another consolidated district. Like the Fairview school over the State line, the best of teachers are employed.

Last but not least comes the Dore, N. Dak., school, which is also consolidated. This is one of North Dakota's best small school buildings, costing in 1915 \$5,000.

As a rule the high schools have teachers with college degrees and the grade teachers have normal diplomas. The people of the Lower Yellowstone project believe in good schools and are willing to pay for them. The people of Montana are thoroughly interested in the higher education of the youth of the State, as shown by the results of last November election, when the people by an initiative measure voted by a good majority in favor of a \$5,000,000 bond issue for the construction of buildings at the State colleges and university.

If the term "County agricultural institute" or some similar term will clear up in the minds of the people the fact that the farm bureau is not just another competing farmers' organization, but a new kind of adult teaching institution instead, the adoption of some such change of title merits consideration.

The county farm bureau, like the State college of agriculture, lends its assistance in every way to building up any and all farmers' organizations within the county, along any legitimate lines, and in developing new organizations in the interest of farmers.

The farm bureau was created to promote agriculture, home, and rural life movement, to make farming an efficient and profitable business, to make rural home life fuller and richer, and to improve the community life of the country as a whole.



ENGINEERING INVESTIGATIONS.

Fluorescein an Aid to Tracing Waters Underground.

By Herman Stabler, Chief Engineer, Land Classification Board, U. S. Geological Survey.

FLUORESCIN, a coal-tar product, stands at the top of the list of chemicals and dyes used for tracing water underground. This substance has a reddish-orange color, but when dissolved in water and diluted appears by reflected light a brilliant green. Its preeminence as an aid to tracing ground water lies in the fact that minute quantities can be detected by the eye without resort to chemical analysis. If material of good quality is used 1 part of fluorescein in 40,000,000 parts of water will be visible to the naked eye and 1 part in 10,000,000,000 can be detected with the aid of a long glass tube so prepared as to give full value to the green color. If a secret test is desired, do not use fluorescein, for it makes its presence known in an unmistakable manner and will prove its case to the most prejudiced observer. To a seeker after truth and publicity it is an ideal helper. It is useless for waters containing free mineral acids, which render it colorless, and is unsuitable for percolation tests on peaty soils for this reason. With this exception it is available for practically universal application. Some mineral constituents of ordinary waters, particularly carbonates, will reduce the visibility of fluorescein, some of the coloring matter will be absorbed by soils through which it passes slowly, and a part tends to settle out in pools or basins, perhaps later to be washed out on agitation by a large inflow of water. These effects are small in most cases but should be considered in determining the "dose" of the indicator to be used. Generally speaking the dose should be computed to give about 1 part in 10,000,000 in the effluent if results visible to the naked eye are desired. The conditions under which the individual experiment is to be undertaken will, of course, furnish some guide to the dosage. Some tests made by the writer several years ago may be of interest.

A kilogram of fluorescein was placed in a stream of 1.2 second-feet flowing into a sink hole in limestone. It was next seen 24 hours later at the outlet of an underground stream flowing 2.5 second-feet and at a point 12,000 feet distant. This stream was turbid and the time required for the flow was so great that passage through large pools was indicated. However, the effluent stream showed a maximum of 0.15 parts per million of fluorescein and the flow continued visible to the naked eye for 60 hours. Apparently 12.5 acre-feet of water were colored with an average intensity of 1 part in 15 or 16 million, and a maximum intensity of more than 1 part in 7 million. With these small quantities and the rather unfavorable condi-

tions—turbid water, passage through pools or basins, and high carbonate content—there was no question whatever of the successful tracing of the flow.

A second experiment from another sink hole leading to the same outlet stream was even more noteworthy. In this case the dye was placed in a stream flowing only 0.1 second-foot at a point 4,000 feet from the outlet. The effluent again showed green for about 60 hours, the average intensity being about 1 part in 34 million. The maximum intensity was greater than before, however, and a comparatively clear surface stream of 3.3 second-feet discharge that received the flow was colored green to the naked eye for several miles and gave rise to considerable comment by the residents of the region.

A third experiment was made with 2 ounces of fluorescein placed in the sink (sandy bed) of a stream flowing 0.1 second-foot. The color appeared one and a half hours later in what was supposed to be a spring free from surface contamination. The spring and sink were only 150 yards apart. The color disappeared from the spring in 30 hours but was visible 3 days later in pools of the branch into which it discharged. This indicates the tendency to settle out in pools.

A fourth experiment of the series involved placing 1.5 pounds of fluorescein in a sink hole in limestone in the bed of a stream flowing half a second-foot. This resulted in coloring a 2 second-foot spring a bright green for two days, beginning 25 hours later. The distance between sink hole and spring was 2,500 feet and the difference in elevation 175 to 200 feet. In this case 4 acre-feet of water was colored with an average intensity of about one part in 7 million. The water was clear and the brilliant green coloring of what was normally a beautiful blue limestone "spring" was a most satisfying proof of the connection that was suspected by some and vigorously denied by others.

In all these experiments an attempt was made to make the dose large enough to give results, for no damage from the excess could result and undeniable proof of underground connection was desired. Probably half of the material could have been saved, but the conditions to be encountered were unknown. The slow and varying velocities of the underground streams, as measured by surface distances, 500 feet per hour, 200 feet per hour, 300 feet per hour, and 100 feet per hour, were unsuspected.

If simple tracing of an underground connection is desired, as in the foregoing cases, the proper method is to dissolve the calculated dose of fluorescein in a

small quantity of water and place it in a single charge at the point where water disappears underground. Then watch all possible springs or wells for results, collecting samples and examining them in a long tube of colorless glass (long to get the color of a great depth of water, and colorless to avoid confusion with the anticipated green) at reasonably frequent intervals. Seepage from a canal can be traced by placing fluorescein in pits or borings along-

side or in the bed of the canal, or, if the canal is closed down, by impregnating a minimum amount of stagnant water in the suspected part of the canal prism. In such cases the rate of underground flow is likely to be only a few feet per day, and there may be a wide diffusion of the waters. A calculated over dose of fluorescein should therefore generally be used, and observations should be continued long enough to make sure of a result.

SURVEYS, MINIDOKA NORTH SIDE PUMPING UNIT, IDAHO.

By Ferd Schlapkohl, Assistant Engineer, U. S. R. S.

THE proposed North Side Minidoka pumping unit comprises about 115,000 acres of irrigable land lying north and west of the present North Side Minidoka project. The country included is quite level and covered with a good growth of sagebrush. A large portion of the tract may be irrigated by pumping 120 feet in three lifts from Lake Walcott and the balance by pumping 150 feet in two lifts from Snake River below the present project.

The first work done on this project was in 1912, when the 120-foot lift was run out to establish the approximate limits and area of the project. Nothing further was done until the spring of 1918, when the actual preliminary surveys were begun. These preliminary surveys consisted of reconnaissance, trial lines, subdivisions or retracement of section lines, level control, and topography.

At the time the preliminary surveys were begun it was thought unnecessary to run additional trial lines or make a reconnaissance; it was planned to complete the detail topography and to make all studies in regard to pumping requirements, etc., from this detail topography. In the spring of 1919, however, it was decided to begin the studies of the pumping requirements at once, so trial lines were run out and a topographic reconnaissance was made of the west end of the project.

The running of the trial lines consisted of making a rough preliminary location of the three main canals, the 40-foot, 80-foot, and 120-foot lift canals. These lines were run out with a transit only, levels being carried along with it, and all distances read by stadia. A fall of a foot in a mile was allowed. The idea was to obtain the approximate acreage under each lift.

The topographic reconnaissance covered approximately 86,000 acres and was also done roughly. A scale of 1 inch=3,000 feet, with a 25-foot contour interval, was used. The work was done with a plane table. The sections were plotted on the sheet according to the original land office surveys and these were used as a control, the party following the east and west section lines taking occasional substations off these as required. Three signals had been set on

prominent points in an area covered by the subdivision party. From the notes of this party the locations of these signals were computed and plotted on the sheet. Levels were also carried to these signals, serving as a rough check. The entire 86,000 acres were covered in 33 days, averaging about 2,600 acres per day. The results of this reconnaissance proved satisfactory. The controlling features were shown up in good shape, making it possible to lay out a preliminary scheme of irrigating this western portion of the project.

The first work actually done on this preliminary survey consisted of subdivision or retracement of section lines. Practically the entire area had been originally subdivided in 1891. The retracement consisted of finding the true distances and the angles between the corners, the angles being computed from the bearings using the east boundary of each township as a true north line. Random lines were run on the bearings as given in the original survey. The offsets of the corners from these random lines were measured and the true bearings and angles computed from these. It might be of interest to note that the original survey both in distance and in bearings was found to be fairly accurate. The corners were also found to be in good shape except in a few cases. In the field the boundaries of each township were run out first and the closing error computed; then the north and south and the east and west lines between the tiers of sections were run. From this, the latitudes and departures of the corners were computed. The rule adopted for allowable closing error for each section was that the square root of the sum of the squares of the errors in latitude and departure should not exceed 5 feet.

The regular iron pipe corners stamped and marked in accordance with the General Land Office regulations were set up against and touching the original rock corners, which were left undisturbed. In setting these corners, which were approximately 36 inches in length, a brief classification of the soil was made giving the depth and nature of the top and subsoils. These corners were set by a party of two men working under the direction of the subdivision party. This

party also set signals on prominent points, setting them so that 3 signals would ordinarily fall on each topographic sheet, an index map having been prepared before work was started. The signals intended for sights of not to exceed 2 miles consisted of a 2 by 2 inch pole about 12 feet high with a flag at the top. The subdivision party turned angles from three or four corners or points on line to these signals. Their locations were then computed for the use of the topographic party.

The subdivision party was followed by the level party. Bench marks were established on every section corner and quarter corner. Closures were made around each section. The allowable error in closing was 0.03 times the square root of the number of miles run. As an indication of the accuracy of the levels obtained, in the spring of 1919, on account of the muddy roads, work was suspended in the area lying north of the present North Side Minidoka project and was started in the area lying west. No levels had been carried to this portion of the proposed project, so it became necessary to take an elevation from the system of levels used on the North Side Minidoka project and originating from the same bench mark used on the proposed project. Later a tie was made between the levels in the west portion and those in the north, thereby closing a circuit over 50 miles in length, with an error of 0.092 feet.

Following the subdivision and level control comes topography. A scale of 1 inch = 400 feet, with a 2-foot contour interval, is used. The work is done with a planetable, the planetable sheets being 24 by 30 inches, covering an area 2 miles long by a mile and a half wide. The section corners and signals previously described are accurately plotted on the sheets before they are sent to the field, and these sheets are used for control. This method has proven to be very satisfactory. It is rarely necessary to change the location of a corner as plotted on the sheet. In taking this topography a planetable and a transit are used together. The planetableman gets the azimuth, records the shots, and sketches in the contours while the recorder with the transit reads the stadia distance and vertical angle and, with a stadia slide rule, computes the elevation. In this way it is possible to keep three rodmen busy. The rodmen usually travel in parallel lines, giving on an average one shot to an acre. The average per day per party is about 150 acres. After the sheets have been completed in the field they are taken into the office, the edging is checked, and the contours and shots are inked in. They are then traced, each section being traced by itself on a standard size 15½ by 22½ inch sheet. On a scale of 1 inch = 400 feet, a section is approximately 13 inches square, which, with a margin, will leave a space about 6 by 13 inches, which is intended to be used in listing the farm units in the section and tabulating the Land Office areas, actual areas, areas

to be deducted on account of rock, canal, lateral, and railroad rights of way, high land, etc., also the irrigable areas and areas coming under the different lifts. In this way each sheet will have all the information pertaining to the section shown and will be complete in itself.

Having computed the coordinates of each section and quarter section corner, these are platted on planetable sheets on a scale of 1,000 feet to the inch and the topography reduced to this scale with a pantograph. Reproductions of these sheets will probably be made in Washington for field use in canal location.

The field work in 1919 was confined principally to the period March to October, inclusive, the crews being engaged on other surveys in the earlier and later parts of the year.

During 1918 the work was handled from Minidoka Dam, but in February, 1919, a tent camp was established in Paul, where a large room was rented for an office. At the time of writing the following work had been accomplished:

One hundred and twenty-one thousand two hundred and forty-eight acres of detail topography, at \$0.246 per acre.

Four hundred and seventy-six miles of level control, at \$13.09 per mile.

Six hundred and six miles of subdivision, at \$15.65 per mile.

Eighty thousand acres of reconnaissance topography, at \$0.13 per acre.

The above cost on subdivision and topography does not cover these features to completion. In the case of topography the cost given covers the field work, inking in of topographic sheets, reducing scale from 1 inch = 400 feet to 1 inch = 1,000 feet, inking in and tracing of the reduced sheets, and tracing of about one-third of the 1 inch = 400 feet sheets; there remain about two-thirds of the sheets to be traced, which will not affect the above cost to any great extent. In subdivision about two sections remain to be checked and a few more coordinates to complete, which should not affect the cost greatly.

In addition to the above, detailed topography on a scale of 20 feet to the inch was taken at the proposed location of each of the four pumping station sites; and many test holes to determine the depth to bed rock were dug. In the office the planetable sheets have been inked in and reduced from a scale of 400 feet to the inch to 1,000 feet to the inch.

If beech trees are headed low there will be less opportunity for lovers and jackknife vandals to mutilate the bark with crude art. Beeches and birches suffer most by the aimless jackknife. If landowners realized that this objection could be overcome easily by training the limbs low, the trees would be greater favorites.

IRRIGATION STATISTICS, FOURTEENTH CENSUS.

The Director of the Census announces, subject to correction, the following preliminary statistics on irrigation for the counties named. Similar statements for

other counties will be issued as soon as the figures are available and will be published from time to time in the RECLAMATION RECORD.

Irrigation by counties, 1920 and 1910.

State and county.	Acreage to be irrigated by works either completed or under construction.			Acreage to which existing works are capable of supplying water.			Acreage irrigated.			Acreage available for settlement in 1920. ³
	1920	1910	Increase. ¹	1920	1910	Increase. ¹	1919	1909	Increase. ¹	
California:										
Amador.....	1,033	4,139	- 3,110	439	3,973	- 3,534	776	826	- 50	.....
Calaveras.....	42,093	3,919	38,174	33,828	3,161	30,667	2,859	1,275	1,584	.....
El Dorado.....	16,848	20,264	- 3,416	9,833	5,501	4,332	6,724	5,122	1,602	937
Lassen.....	85,873	149,530	- 63,657	71,382	89,815	- 18,433	53,884	77,079	- 23,195	3,836
Modoc.....	111,902	124,166	- 12,264	89,854	89,416	378	82,852	82,075	777	2,420
Nevada.....	5,602	5,267	335	5,002	4,259	743	3,451	3,839	- 388	84
Placer.....	3,618	61,751	- 58,133	1,660	23,365	- 21,705	1,103	16,845	- 15,742	70
Plumas.....	37,901	28,266	9,635	25,424	37,529	- 12,105	22,763	36,602	- 13,834	.....
Montana:										
Dawson.....	7,653	.....	.....	6,538	.....	.....	1,746	.....	.....	893
Madison.....	265,164	191,230	73,934	172,000	118,115	53,885	115,560	102,179	13,381	3,519
Nevada:										
Clark.....	10,512	22,016	- 11,504	6,122	16,844	- 10,722	5,200	8,116	- 2,916	1,635
Douglas.....	43,191	37,649	5,542	24,472	35,548	- 11,076	23,412	32,181	- 8,769	19,220
Elko.....	434,572	262,315	172,257	263,400	189,253	74,147	202,724	183,552	19,172	115
Eureka.....	5,404	23,608	- 18,204	5,134	21,973	- 16,839	5,086	18,715	- 13,629	.....
Humboldt.....	45,331	304,152	-258,821	31,695	228,845	-197,150	27,884	207,753	-179,869	2,018
Lander.....	28,637	54,285	- 25,648	10,745	24,085	- 13,340	10,900	23,342	- 12,442	.....
Lincoln.....	20,366	16,124	4,242	10,752	15,391	- 4,639	5,826	9,907	- 4,081	2,420
Lyon.....	332,815	260,354	72,461	135,055	116,222	18,833	113,172	62,148	51,024	16,537
Mineral.....	12,937	.....	.....	7,662	.....	.....	5,212	.....	.....	15
Nye.....	70,601	34,062	36,539	14,171	28,902	- 14,731	11,354	19,978	- 8,624	1,713
Ormsby.....	7,410	2,466	4,944	4,718	2,466	2,252	3,146	2,426	720	2,103
Washoe.....	59,978	82,600	- 22,622	31,570	54,551	- 22,981	28,801	50,904	- 22,103	7,000
White Pine.....	47,761	52,918	- 5,157	28,202	49,229	- 21,027	24,270	32,795	- 8,525	1,280
Oregon:										
Baker.....	284,637	241,919	42,718	219,048	136,014	83,034	171,380	129,673	41,707	1,000
Crook.....	62,401	.....	.....	52,757	.....	.....	42,708	.....	.....	1,278
Douglas.....	8,375	9,349	- 974	3,328	4,500	- 1,172	1,946	1,708	238	.....
Hood River.....	39,610	48,964	- 9,354	21,101	14,150	6,951	19,765	8,071	11,694	15,579
Jackson.....	107,097	82,427	24,670	34,891	17,978	16,913	23,917	12,239	11,678	2,471
Jefferson.....	6,171	.....	.....	3,756	.....	.....	3,320	.....	.....	.....
Klamath.....	25,167	24,059	1,108	18,294	14,503	3,791	14,903	12,866	2,037	1,507
Josephine.....	238,967	208,105	30,862	135,048	62,785	72,263	90,632	46,975	43,657	2,000
Lake.....	183,597	273,546	- 89,949	149,497	59,612	89,885	99,220	57,078	42,142	.....
Union.....	69,511	45,517	23,994	61,563	37,260	24,303	53,203	35,831	17,372	.....
Wallowa.....	64,877	54,692	10,185	57,048	42,855	14,193	52,201	39,370	12,831	.....
Wasco.....	48,732	17,276	31,456	13,918	5,989	7,929	9,387	5,703	3,684	.....
Wheeler.....	11,055	9,414	1,641	8,737	6,983	1,754	7,525	6,253	1,272	.....
Utah:										
Beaver.....	50,180	31,931	18,249	45,829	26,630	19,199	28,113	24,430	3,683	16,874
Box Elder.....	145,465	129,034	16,431	100,636	94,133	6,503	86,634	75,926	10,708	15,590
Cache.....	97,407	119,304	- 21,897	93,289	82,503	10,886	91,500	77,330	14,170	80
Carbon.....	33,381	40,778	- 7,397	22,458	30,862	- 8,404	21,676	11,620	10,056	10,700
Daggett.....	10,600	.....	.....	10,599	.....	.....	6,572	.....	.....	3,750
Duchesne.....	225,929	.....	.....	140,100	.....	.....	90,435	.....	.....	30,200
Emery.....	112,943	87,303	25,640	98,933	50,524	48,409	91,145	46,776	44,369	19,120
Grand.....	11,050	22,372	- 11,322	9,664	8,723	941	5,856	6,759	- 903	.....
Kane.....	7,114	6,633	1,481	4,469	3,330	1,139	4,138	3,220	918	45
Millard.....	373,926	241,922	132,004	209,694	91,788	117,906	137,980	48,992	88,988	29,116
Piute.....	10,938	51,253	- 40,315	10,258	15,406	- 5,148	8,514	13,262	- 4,748	.....
Salt Lake.....	176,122	121,452	54,670	125,194	100,555	24,639	101,151	82,710	18,441	20,505
San Juan.....	61,169	21,254	39,915	34,115	9,336	24,779	19,221	8,915	10,306	4,715
San Pete.....	141,608	133,589	8,019	91,885	90,389	1,496	90,153	88,959	1,194	.....
Summit.....	34,795	46,312	- 11,517	32,439	39,313	- 6,874	32,139	37,245	- 5,106	.....
Uinta.....	147,608	.....	.....	127,787	.....	.....	80,789	.....	.....	1,100
Utah.....	203,013	127,020	75,993	173,487	102,926	70,561	138,131	89,886	48,245	27,664
Weber.....	105,905	56,160	49,745	70,846	48,131	22,715	48,900	47,505	1,395	.....
Washington:										
Davis.....	19,969	35,245	- 15,276	19,133	25,447	- 6,314	19,065	25,291	- 6,226	.....
Garfield.....	53,998	49,322	4,676	27,253	33,532	- 6,279	27,097	26,437	660	.....
Iron.....	98,475	19,652	78,823	38,858	12,321	26,537	32,066	11,624	20,442	.....
Juab.....	14,707	21,699	- 6,992	12,372	16,949	- 4,577	10,008	14,216	- 4,208	.....
Sevier.....	81,530	68,993	12,537	69,178	52,425	16,753	68,538	51,622	17,216	2,556
Tooele.....	17,370	18,523	- 1,153	11,418	13,606	- 2,188	9,897	12,318	- 2,421	.....
Wasatch.....	24,883	106,841	- 81,958	22,892	49,539	- 26,647	22,197	39,031	- 16,834	.....
Washington.....	43,367	67,681	- 24,314	29,277	24,662	4,615	20,833	18,686	2,147	6,848
Wayne.....	19,690	34,617	- 14,927	18,690	15,980	2,710	16,198	13,842	2,356	800

¹ A minus sign (-) denotes decrease.

² To be supplied with water by works either completed or under construction.

³ Boundaries changed since 1910; hence no comparative figures can be given.

⁴ Organized since 1910; hence no comparative figures can be given.



Form of Patent Under Act of May 20, 1920.

THE act of May 20, 1920 (41 Stat., 605), authorizes the Secretary of the Interior by appropriate patent to convey public lands withdrawn and improved under the act of June 17, 1902 (32 Stat., 388), when such lands are no longer needed for the purposes for which they were withdrawn and improved. Such patent should not be executed by the Secretary of the Interior but should be issued from the General Land Office under Section 458 of the Revised Statutes. (Departmental Decision, Jan. 10, 1921, re Vandalia Ditch and Development Co., Milk River project.)

Right of Action for Obstruction of Stream Accrues at Date of Injury.

The rule that the right of action for obstruction of a stream accrues at date of injury and not at the time the obstructions are built, was well illustrated in the case of the Oregon-Washington Railroad & Navigation Company v. Williams, reported in 268 Fed. Rep., 56. In the case cited it so happened that a period of time in excess of that named in the statute of limitations had run between the date the obstruction was built and the occurrence of the injury and to apply the law as contended for by defendant, would have had the effect of denying any relief against an unlawful act.

Carey Act Amended.

AN Act To amend section 3 of an Act entitled "An Act making appropriations for sundry civil expenses of the Government for the fiscal year ending June 30, 1902, and for other purposes," approved March 3, 1901 (Thirty-first Statutes at Large, page 1133). [Act of Jan. 6, 1921, Public No. 291, 41 Stat., —.]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section 3 of the Act of Congress approved March 3, 1901 (Thirty-first Statutes at Large, page 1133), be, and the same is hereby, amended to read as follows:

"SEC. 3. That section 4 of the Act of August 18, 1894, entitled 'An Act making appropriations for sundry civil expenses of the Government for the fiscal year ending June 30, 1895, and for other purposes,' be, and the same is hereby, amended so that the ten-year period within which any State shall cause the lands applied for under said Act to be irrigated

and reclaimed, as provided in said section, as amended by the Act of June 11, 1896, shall begin to run from the date of approval by the Secretary of the Interior of the State's application for the segregation of such lands; and if actual construction of reclamation works is not begun within three years after the segregation of the lands or within such further period, not exceeding three years, as shall be allowed by the Secretary of the Interior, the said Secretary of the Interior, in his discretion, may restore such lands to the public domain; and if the State fails, within ten years from the date of such segregation, to cause the whole or any part of the lands so segregated to be so irrigated and reclaimed, the Secretary of the Interior may, in his discretion, continue said segregation for a period not exceeding five years, or may, in his discretion, restore such lands not irrigated and reclaimed to the public domain upon the expiration of the ten-year period or of any extension thereof."

Disposition of Public Lands.

AN Act To provide for the disposition of certain public lands withdrawn and improved under the provisions of the Act of Congress approved June 25, 1910 (Thirty-sixth Statutes at Large, page 847), as amended by the Act of August 24, 1912 (Thirty-seventh Statutes at Large, page 497), and which are no longer needed. [Act Jan. 26, 1921, Public No. 297, 41 Stat. —.]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That whenever in the opinion of the Secretary of the Interior any lands which have been withdrawn under the provisions of the Act of Congress approved June 25, 1910 (Thirty-sixth Statutes at Large, page 847), as amended by the Act of Congress approved August 24, 1912 (Thirty-seventh Statutes at Large, page 497), for the purpose of exploratory drilling to discover water supplies for irrigation or other purposes, and which have had wells or other permanent improvements placed thereon by and at the expense of the United States, are no longer needed for the purpose for which they were withdrawn and improved, the Secretary of the Interior may appraise the lands, together with the improvements thereon, and thereafter sell the same to a citizen of the United States for not less than the appraised value at public auction to the highest bidder, after giving public notice of the time and place of sale by posting upon the land and publication for not less than thirty days in a newspaper of general circulation in the vicinity of the land.

SEC. 2. That upon payment of the purchase price the Secretary of the Interior is authorized by appropriate patent to convey all the right, title, and interest in and to said lands to the purchaser at said sale, sub-

ject, however, to such reservations, limitations, or conditions as said Secretary may deem proper: *Provided*, That not over one hundred and sixty acres shall be sold to any one person: *Provided further*, That any patent issued hereunder shall contain a reserva-



HARRY L. HOLGATE.

District counsel, United States Reclamation Service, Portland, Oreg., was born at Corvallis, Oreg., and was graduated from the Oregon Agricultural College at the latter place. He has been admitted to the practice of law before the United States Supreme Court and other Federal and State courts. He practiced law in the State of Oregon, assisted in drafting the Oregon Water Code, and was appointed a member of the first water commission of that State. Mr. Holgate is now legal adviser for the Klamath, Umatilla, Yakima, and Okanogan irrigation projects. Because of a marked similarity in physiognomy to a certain famous Texan, as well as on account of his unusual tact and diplomacy, District Counsel Holgate is sometimes referred to as "Col. House."

tion to the United States of all oil, gas, coal, and other mineral.

SEC. 3. That the moneys derived from the sale of such lands and improvements be disposed of as are other receipts from the sale and disposal of public lands.

Bills Introduced in Congress.

IN THE HOUSE.

H. J. Res. 460: "Joint resolution to change the name of the Grand River in Colorado and Utah to the Colorado River." Introduced January 26, 1921, by Representative Edward T. Taylor of Colorado.

H. R. 15422: "A bill making appropriations for sundry civil expenses of the Government for the fiscal year ending June 30, 1922, and for other purposes." Reported December 29, 1920. Passed the House January 7, 1921. Passed the Senate February 9, 1921, with amendments.

H. R. 15424: "A bill for the reclamation of swamp, cut-over, and overflowed lands, and providing for the cost thereof." Introduced December 29, 1920, by Representative William E. Mason, of Illinois.

H. R. 15543: "A bill making appropriations for the legislative, executive, and judicial expenses of the Government for the fiscal year ending June 30, 1922, and for other purposes." Reported January 6, 1921.

H. R. 15663: "A bill to reorganize the Indian Service, to expedite the settlement of Indian affairs, and for other purposes." Introduced January 11, 1921, by Representative Homer P. Snyder, of New York. This bill provides for the transfer of the irrigation division of the Bureau of Indian Affairs to the Reclamation Service.

H. R. 15806: "A bill to amend section 2 of the act of August 9, 1912 (37 Stat. L., p. 265), relating to liens in patents and water-right certificates." Introduced January 19, 1921, by Representative Moses P. Kinkaid, of Nebraska.

H. R. 15812: "A bill to make appropriations for the Department of Agriculture for the fiscal year ending June 30, 1922." Passed the House January 27, 1921.

H. R. 15966: "A bill authorizing an appropriation for continuing irrigation and drainage on the Yakima Indian Reservation." Introduced February 1, 1921, by Representative John W. Summers of Washington.

H. R. 15990: "A bill to provide for the disposal of certain waste and drainage water from the Rio Grande project, New Mexico-Texas." Introduced February 3, 1921, by Representative C. B. Hudspeth of Texas.

IN THE SENATE.

S. 4421: "A bill securing rights of way and easements over public land in connection with Federal irrigation projects." Favorably reported out of Senate committee February 2, 1921.

S. 4859: "A bill for the relief of certain ex-service men whose rights to make entries on the North Platte irrigation project, Nebraska-Wyoming, were defeated by intervening claims." Introduced January 17, 1921, by Senator Francis E. Warren of Wyoming.

S. 4931: "A bill authorizing the Secretary of the Interior in certain cases to reconvey real property

donated for use in connection with Federal irrigation projects." Introduced January 26, 1921, by Senator Charles L. McNary of Oregon.

Frank J. Bergin Admitted to the Bar.

Frank H. Bergin, of the Washington office, who has the degree of LL. B. from the Law School of Georgetown University, was admitted to the bar of the District of Columbia on January 31, 1921.

—Ottamar Hamel.

JANUARY WEATHER IN THE WESTERN STATES.

By P. C. Day, United States Weather Bureau.

The new year 1921 came in with warm weather prevailing in the West, and there was no notable turn in temperature conditions till near the 10th, when it became somewhat cooler for several days in the Pacific States, and quite cold for a briefer period near the northern border. Mild weather was the rule, however, except in the Pacific and western plateau region during the final decade, when it was generally somewhat cooler than the normal. The month averaged cooler than normal in much of California and western Arizona, but elsewhere warmer, especially in Montana and to eastward and southeastward, where some stations averaged 14° or more above their normal January temperatures, making this about as warm as any January on record.

In Washington, Oregon, and northern California there was liberal precipitation during the first two-thirds of the month, and some during the last few days; but in central and especially southern California the precipitation came mainly after the middle of the month, and in southern California the dryness that had become serious was well relieved. In the Plateau States and to eastward the precipitation came chiefly about the 23d, except that north of the 40th parallel there was much also on the opening days of the month; but the middle portion and the last week were comparatively dry in these districts. The month was wetter than normal in nearly all parts of the Pacific States, but in only a few scattered districts anywhere to eastward of those States did the monthly precipitation exceed the normal. One district of excess covered most of the drainage area of the Platte; another embraced the northern parts of New Mexico and western Texas. The precipitation deficiency was very marked in Montana, Nevada, and an area stretching from southeastern Arizona eastward along the Mexican boundary.

The month was, in the main, very favorable for live stock, for crops, and for outdoor work.

HYDROGRAPHER WANTED.

The United States Civil Service Commission announces an open competitive examination for hydrographer. A vacancy in the Reclamation Service, Provo, Utah, and vacancies in positions requiring similar qualifications, at \$1,500 to \$1,800 a year, or higher or lower entrance salaries, will be filled from this examination, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer, or promotion.

Duties.—The duties of the position consist of measuring the flow of water in the canals and streams and making reports thereon; compiling the yearly hydrographic and crop reports; the repair of the gauging stations prior to the irrigation season and their upkeep during the operating season.

Subjects and weights.—Competitors will not be required to report for examination at any place, but will be rated on the following subjects, which will have the relative weights indicated:

Subjects.	Weights.
1. Education and preliminary training-----	40
2. Experience and fitness-----	60
Total-----	100

Education and training.—Applicants must show that they have had the equivalent of a four years' high-school education, and training in mathematics equivalent to that given during the first two years in a college or university of recognized standing. Additional credit will be given to those who specialized in hydraulics.

Experience.—Applicants must show that they have had not less than two years of practical experience in hydrographic work, including the measuring of the flow of water and compiling hydrographic data. Additional credit will be given under this subject for experience in water supply studies.

Age.—Applicants must have reached their twenty-second but not their seventieth birthday on the date of the examination. In view of the retirement act, should the appointing officer so request, certification will not be made of eligibles who have reached their fifty-fifth birthday.

Applications.—Applicants should at once apply for Form 1312, stating the title of the examination desired, to the Civil Service Commission, Washington, D. C.; the Secretary of the United States Civil Service Board, Customhouse, Boston, Mass., New York, N. Y., New Orleans, La.; Post Office, Philadelphia, Pa., Atlanta, Ga., Cincinnati, Ohio, Chicago, Ill., St. Paul, Minn., Seattle, Wash., San Francisco, Calif.; Old Customhouse, St. Louis, Mo.

Applications should be properly executed, excluding the medical certificate, and must be filed with the Civil Service Commission, Washington, D. C., prior to the hour of closing business on March 22, 1921.

MONTHLY PROGRESS REPORTS FOR JANUARY.

Monthly conditions of principal Reclamation Service reservoirs for January, 1921.

[Elevation above sea level.]

State and project.	Reservoir.	Available capacity, in acre-feet.	Elevation.		Storage in acre-feet.			Out-flow in acre-feet.	Elevation of water surface.		
			Spill-way crest. ¹	Lowest gate sill. ²	Begin-ning of month.	End of month.	Maxi-mum.		Begin-ning of month.	End of month.	Maxi-mum.
Arizona, Salt River.....	Roosevelt ³	1,305,000	2128	1903	934,892	925,266	934,892	9,626	2099.87	2099.18	2099.87
California, Orland.....	East Park.....	51,000	1199.68	1111.68	38,380	49,800	51,000	19,230	1192.21	1199.03	1199.68
Idaho:											
Boise.....	Arrowrock.....	280,000	3211	2956	49,050	117,900	117,900	27,000	3095.5	3143	3143
	Deer Flat.....	177,000	2518	2488	84,220	80,796	84,220		2506.75	2506.25	2506.75
Minidoka.....	Lake Walcott.....	95,180	4245	4236	83,770	77,790	83,520	1,876	4244.02	4243.49	4244.17
	Jackson Lake.....	847,000	6769	6730	239,160	270,420	270,420				
Montana:											
Milk River.....	Nelson.....	27,000	2212	2200	18,600	17,700	18,600		2209	2208.6	2209
St. Mary Storage.....	Sherburne.....	33,000	4788	4720							
Sun River.....	Willow Creek.....	16,700	4130	4085	12,209	12,686	12,686		4125.3	4125.8	4125.8
Nebraska-Wyoming, North Platte.....	Pathfinder.....	1,070,000	5852	5670	691,370	715,330	715,330	5,130	5831.94	5833.46	5833.46
	Lake Alice.....	11,400	4182	4159	6,999	5,623	6,999		4175.7	4173.4	4175.7
	Lake Minatare.....	60,700	4125	4074	48,608	48,021	48,608		4119.1	4118.8	4119.1
Nevada, Newlands.....	Lake Tahoe.....	120,000	6230	6224				7,720	6224.75	6224.85	6224.87
	Lahontan.....	290,000	4162	4060	125,400	140,400	140,400		4141	4144	4144
New Mexico:											
Carlsbad.....	McMillan.....	45,000	3267.7	3241.6	23,000	30,750	30,750		3263.3	3261.5	3261.5
Rio Grande.....	Elephant Butte.....	2,638,800	4407	4321.5	1,725,827	1,751,376	1,751,376		4381.1	4381.82	4381.82
Oregon, Umatilla.....	Cold Spring.....	50,000	621.5	560	32,750	45,500	45,500		608.88	618.48	618.48
Oregon-California, Klamath.....	Clear Lake.....	462,000	4540	4514	266,000	299,000	299,000		4532.02	4533.51	4533.51
South Dakota, Belle Fourche.....	Belle Fourche.....	203,000	2975	2920	153,400	163,860	163,860		2968.2	2969.7	2969.7
Utah, Strawberry Valley.....	Strawberry.....	250,000	7558	7517	198,000	203,350	203,350		7550.8	7551.5	7551.5
Washington:											
Okanogan.....	Conconnully.....	14,400	2290	2232	1,250	1,549	1,549		2250	2252.31	2252.31
Yakima.....	Bumping Lake.....	34,000	3426	3389	12,265	10,565	14,945	4,380	3406.3	3404.2	3409.3
	Lake Clealum.....	22,800	2134	2122	27,660	25,100	28,620	3,520	2135.5	2134.4	2136
	Lake Kachess.....	210,000	2258	2192	142,615	165,720	165,720		2239.1	2245	2245
	Lake Keechelus.....	152,000	2515	2425	53,415	79,005	79,005		2465.1	2480.9	2480.9
Wyoming, Shoshone.....	Shoshone.....	456,600	5360	5132.3	316,618	293,846	316,618	50,744	5336.3	5331.8	5336.3

¹ Or maximum storage.² Or zero storage.³ Zero water depth at elevation of 1902.2.⁴ Amount of silt shown by silt survey deducted from original capacity.⁵ Proposed regulation.⁶ Estimated low-water limit under proposed plan of regulation.⁷ Vested power draft.

SALT RIVER PROJECT, ARIZONA.

Operation and maintenance of irrigation system.—

Water was run in all of the canals during January with the exception of the Western and Highline, the water being out of these canals for a period of 10 days for repair work.

The demand for irrigation water is steadily increasing.

There were three maintenance crews in the field and the following shows the average number of men and stock employed and the results accomplished: Average number of men, 43; average number of stock, 1.6; miles main canals cleaned, 10½; miles laterals cleaned, 13½; number of new structures installed, 5; number of old structures repaired, 59; riprap placed, 633 feet; dry masonry placed, 10 cubic yards; dirt fill placed, 68 cubic yards; concrete placed, 38 cubic yards; concrete pipe placed, 218 feet; corrugated pipe placed, 50 feet.

All work in connection with widening Eastern Canal was discontinued the first of the year, Monighan 2-yard and Marion ¾-yard draglines being idle.

The Austin trencher excavated 8,620 linear feet of trench for subdrainage in the Laveen District. In connection with this work 2,100 feet of 18-inch concrete pipe and 5,350 feet of 15-inch vitrified pipe were laid, 7,150 linear feet back filled, and 5 manholes completed with a daily average of 24 men and 7 head of stock.

Work was completed on the sixth pump house for subdrainage. Work was discontinued on the 8th of the month.

Work was started on the program to increase by 50 per cent the water supply of the Highline Canal. This involves increasing the capacity of the syphon under the two branches of the Arizona Eastern Railroad and the Tempe Canal, the installation of air vents on the Highline pipe line, raising the existing surge chamber 8 feet, change of existing pump runners, and the installation of new motors and transformers.

Operation of power system.—The total power generated during the month was 4,207,510 kilowatt hours. The Roosevelt power plant operated 742 hours and generated 3,683,000 kilowatt hours. The Cross Out operated continuously and generated 223,600 kilowatt hours. The Arizona Falls operated 191 hours, generating 25,050 kilowatt hours. The South Consolidated operated 713.4 hours, generating 126,200 kilowatt hours, and the Chandler plant operated 637 hours, generating 149,660 kilowatt hours.

The substations all operated without trouble during the month. The pumping plants were all available for service as needed. Battery No. 2 was thoroughly overhauled.

Construction work, Roosevelt.—Construction work was completed on the deflecting wall in the north spillway, the new cut-off wall to bedrock and the repairs of the south spillway apron, partially destroyed during last winter's floods.

Metering equipment.—Metering equipment was installed for the following customers: Arcadia Water Co., McCall Cotton Gin, Peoria, Stockwell's Ranch No. 1, Stockwell's Ranch No. 2, Strangman's Ranch

No. 1, R. J. Haynes ranch, Dr. Dysart's ranch, R. G. Barton's ranch.

Meters were tested and adjusted at the substation of the Central Arizona Light & Power Co.

A temporary bank of transformers and a 40-horsepower motor driving a pump were installed for Twohy Bros. at their Tempe gravel plant.

The transformer substations were completed during the first week of the month at pumping plants 17E-7½N, 18E-7½N, 15E-8N, 16E-8N, and 17E-8N.

Office.—A total of 140,898 acres was entitled to irrigation water service on the 1st of February.—*C. C. Cragin.*

YUMA PROJECT, ARIZONA-CALIFORNIA.

January weather conditions were favorable. Planting had begun and indications were that the acreage of cotton would be approximately four-tenths of that of last season, with a change to alfalfa and grains.

Construction.—On the East Drain the Bucyrus dragline advanced 0.21 mile, excavating 13,000 cubic yards of earth.

Operation and maintenance.—The demand for water was light; 4,000 acre-feet were delivered. Monighan dragline No. 1 continued work on the Somerton Canal, advancing 1 mile and excavating 10,500 cubic yards silt. Monighan dragline No. 2 cleaned 0.55 mile of the West Main Canal, excavating 5,800 cubic yards of silt, and was being overhauled before starting on the South Drain. Ruth dredger No. 8 cleaned 6 miles of laterals, excavating 7,800 cubic yards of silt, and Ruth dredger No. 7 cleaned 4½ miles of laterals, excavating 4,200 cubic yards of silt.

On the Indian reservation Ruth dredger No. 6 was laid up for repairs a part of the month, but cleaned 1.7 miles of lateral, excavating 1,700 cubic yards of silt.

The maximum discharge of the Colorado River was 8,600 second-feet, minimum 5,200 second-feet. On January 31 the gage height was 16.0, with a discharge of 8,200 second-feet. Total discharge for the month was 427,000 acre-feet.

Imperial Valley investigations.—Office work on record drawings was continued.

Official visitors were Project Manager S. O. Harper, Grand Valley project, and A. T. Strahorn, United States Bureau of Soils.—*R. M. Priest.*

YUMA AUXILIARY PROJECT, ARIZONA.

January weather conditions were favorable for construction work. Camp was constructed at the rock quarry in section 2 on the mesa and the crushing plant put in operation. About 1,200 cubic yards of rock were crushed and put on the road leading from the county road to the B Lift pumping site; 1 mile of road was rock surfaced. This rock was hauled in 3-cubic yard Troy trailers behind 75-horsepower Holt caterpillar tractors. The average haul was about 4½ miles.

George Co., working on contract No. 832, specifications No. 388, completed their work on January 22 and were given their final estimate. Design of concrete pipe manufacturing plant was worked out and material for the erection requisitioned.—*S. A. McWilliams.*

ORLAND PROJECT, CALIFORNIA.

January weather conditions were unfavorable for outside operations. Beginning with the 13th there were 11 rainy days, during which the precipitation

was 7.15 inches, which is 3.5 inches above the average for the month. The total rainfall to the end of the month was 17.10 inches, which is about 5.5 inches in excess of the average for the period. Water began passing over the spillway at East Park on the 18th. The maximum flow of Stony Creek for the season at Orland occurred on the 30th, with an estimated discharge of 25,000 second-feet. The maximum discharge at the Simpson Bridge gauge was 20,000 second-feet.

Most of the construction work accomplished was done during the first 15 days of the month. The total concrete lining placed was 29,740 square yards. There were 9 miles of laterals cleaned and repaired.

Practically no development or farm work was done on the project. The market for farm products was inactive and shipments of produce and live stock were light.—*A. N. Burch.*

Prevailing crop prices at close of January, 1921.

Project.	Alfalfa hay, per ton.		Barley, per bushel.	Oats, per bushel.	Wheat, per bushel.	Potatoes, per bushel.
	In stack.	Baled at ship- ping point.				
Salt River.....	\$18-\$22	\$22-\$28				
Yuma.....	18.00	23.00				
Orland.....	20.00	25.00	\$0.64		\$1.38	
Grand Valley.....	12.00	16.00	1.25	\$0.70	1.25	\$0.75
Uncompahgre.....	5-7		1.50	.60	1.05	.60
Boise.....	6.00	12.00	.55	.65	1.20	.60
King Hill.....	9.00	13.50		.96		1.05
Minidoka.....	5.00	10.00	.48	.40	1.14	.38
Huntley.....	5.00	10.00				1.25
Milk River.....	9.00	12-15	.24	.21	1.29	1.50
Sun River.....	8.00	12.50	.65	.60	1.23	.75
Lower Yellowstone..	10.00	14.00	.75	.60	1.33	1.00
North Platte.....						
Newlands.....	8.00	14.00				
Carlsbad.....						
Rio Grande.....	20-25				1.95	
North Dakota pumping.....						
Umatilla.....	7.50					
Klamath.....	14.00	25.00	.72	.56	1.50	1.50
Belle Fourche.....	3-5	8.00		.45	1.35	1.50
Strawberry Valley..	15.00	17.50	.90	.65	1.45	1.25
Okanogan.....	20.00	25.00				1.50
Yakima:						
Sunnyside unit.....	10.50	14.50				.60
Tieton unit.....	10.50	14.50				.60
Riverton.....						
Shoshone.....	5-7	9.00		.60	1.35	.60
Indian projects:						
Blackfoot.....			.18	.15	1.24	
Flathead.....	12.00	20.00		.64	1.16	.60
Fort Peck.....	12.00	15.00		.34	1.14	1.50

GRAND VALLEY PROJECT, COLORADO.

January weather was unusually mild, the mean temperature for this month being the highest that has been experienced for 10 years. There was little frost in the ground and conditions were favorable for construction and maintenance work. Labor was plentiful.

The market for farm produce remained in an unsatisfactory condition. On account of the mild winter there was little demand for hay, and range cattle came through in excellent condition without feeding on the project. The crop report for last season indicates an average yield of \$56 per acre as compared with \$64 for the previous year.

Maintenance work performed during the month consisted of repairs to structures and miscellaneous

obs which could be handled economically at this season. No earthwork or canal cleaning was undertaken. The operating machinery and storage battery plant at the diversion dam and the machinery at the Price-Stud pumping plant were overhauled. The maintenance gangs at the two camps were employed on extending the upper approaches to the Big Salt Wash and Mack Wash flumes, riprapping portions of the main canal, and installing minor structures.

Drainage construction was continued with two dragline excavators working in the Grand Valley drainage district and one excavator on the project. One and one-tenth miles of drain were completed, involving 31,000 cubic yards of excavation. Considerable time was spent in overhauling one of the machines. A new half yard P. & H. drag line was received and erected.

The annual meeting of the Grand Valley Water Users' Association was held on the 11th, but as a quorum of the stock was not represented, no official business could be transacted.—S. O. Harper.

Project weather during January, 1921.

Project.	Station.	Temperature, °F.			Precipitation (inches).
		Maxi-mum.	Mini-mum.	Mean.	
Salt River.....	Phoenix, Ariz.....	77	27	52	0.13
Yuma.....	Yuma, Ariz.....	74	28	52.8	.70
Orland.....	Orland, Calif.....	58	30	43.8	7.15
Grand Valley.....	Grand Junction, Colo.....	58	5	31	.21
Uncompahgre.....	Montrose, Colo.....	54	2	30	.23
Boise.....	Boise, Idaho.....	56	14	34.8	1.57
King Hill.....	Glenns Ferry, Idaho.....	49	8	32.5	.68
Minidoka.....	Burley, Idaho.....	56	-3	29.4	1.23
Huntley.....	Ballantine, Mont.....	55	2	26.7	.15
Milk River.....	Malta, Mont.....	58	-2	22.6	.06
St. Mary storage.....	Near Babb, Mont.....	41	-16	26.5	.74
Sun River.....	Fort Shaw, Mont.....	57	0	30.5	.05
Lower Yellowstone.....	Savage, Mont.....	47	-12	21.9	.04
North Platte.....	Wyncote, Wyo.....	62	-8	28.5	1.28
Newlands.....	Fallon, Nev.....	59	12	35	.04
Carlsbad.....	Carlsbad, N. Mex.....	76	12	33	.28
Rio Grande.....	El Paso, Tex.....	77	21	48.6	.06
North Dakota pump-ing.....	Williston, N. Dak.....	44	-8	18	.15
Umatilla.....	Hermiston, Oreg.....	58	11	36.3	1.11
Klamath.....	Klamath Falls, Oreg.....	46	4	29.5	1.91
Belle Fourche.....	Orman, S. Dak.....	65	-4	29.8	.3
Strawberry Valley.....	Provo, Utah.....	53	1	30.7	2.79
Okanogan.....	Omak, Wash.....	51	-9	24.7	2.93
Yakima:					
Sunnyside unit.....	Sunnyside, Wash.....	62	14	34.8	.68
Tieton unit.....	Cowiche, Wash.....	50	12	30.4	1.78
Riverton.....	Diversion Dam, Wyo.....	50	-19	23.5	T.
Shoshone.....	Powell, Wyo.....	56	-3	25.7	.02
Indian projects:					
Blackfeet.....	Browning, Mont.....	43	-17	19.5	.35
Flathead.....	St. Ignatius, Mont.....	53	1	28.5	.59
Fort Peck.....	Poplar, Mont.....	53	-11	20.5	.06

UNCOMPAHGRE PROJECT, COLORADO.

January weather was favorable for the brushing of canal banks and other minor maintenance work.

The P. & H. dragline worked all month on the Ironstone slide between milepost 0+86 and milepost 1+03.

The snow melted on the fields during the first few days of the month, and the winter wheat was exposed, but no damage resulted. The weather was favorable for fruit.

There was little snow in the valleys during the month, but in the San Juan Mountains and a portion of the Gunnison watershed the snowfall at the end of the month was above normal for this time of year.

Small quantities of water were carried in some of the canals for stock purposes.

Labor was plentiful. The following schedule of wages was announced for the project, effective February 1, 1921, which is a cut of 10 to 25 per cent from those in force during the past year:

Laborers: \$2.24, plus increased compensation.

Teamster with 2 horses: \$5.52, no increased compensation.

Teamster with 3 horses: \$6.76, no increased compensation.

Teamster with 4 horses: \$8, no increased compensation.

R. M. Taylor, Pacific coast representative of the Pawling & Harnischfeger Co., was a visitor on the project January 18 and 19. Thomas B. Hyde, master mechanic, Grand Valley project, was a visitor on January 18.—Porter J. Preston.

Summary of employees for January, 1921.

Projects.	Begin-ning of month.	End of month.	Increase.	Decrease.
Yuma.....	150	205	55	.....
Orland.....	120	113	.....	7
Grand Valley.....	66	80	14	.....
Uncompahgre.....	48	73	25	.....
Voise.....	108	146	38	.....
Minidoka.....	90	100	10	.....
Huntley.....	12	12	.....	.....
King Hill.....	103	37	.....	66
Milk River.....	55	44	.....	11
St. Mary storage unit.....	14	14	.....	.....
Sun River.....	55	52	.....	3
Lower Yellowstone.....	24	23	.....	1
North Platte.....	473	374	.....	99
Newlands.....	67	113	46	.....
Carlsbad.....	17	65	48	.....
Rio Grande.....	591	1,160	569	.....
North Dakota pumping.....	33	29	.....	4
Umatilla.....	30	28	.....	2
Klamath.....	57	50	.....	7
Strawberry Valley.....	62	61	.....	1
Belle Fourche.....	23	17	.....	6
Okanogan.....	67	26	.....	41
Yakima.....	123	121	.....	2
Riverton.....	37	42	5	.....
Shoshone.....	181	206	25	.....
Denver office.....	84	83	.....	1
Blackfeet (Indian).....	4	4	.....	.....
Flathead (Indian).....	130	110	.....	20
Fort Peck (Indian).....	11	11	.....	.....
Field legal offices.....	23	24	1	.....
Washington office.....	91	89	.....	2
Unassigned per diem.....	17	15	.....	2
Examiners' force.....	2	2	.....	.....
Total employees.....	2,968	3,529	.....	.....
Increase.....	.....	.....	836	.....
Decrease.....	.....	.....	.....	275
Net increase.....	.....	.....	561	.....

BOISE PROJECT, IDAHO.

The weather during January was mild. Although the majority of the days were cloudy, precipitation was below normal and deficiency for the month was 0.32 of an inch. Light snowfall occurred at intervals, which melted in a short time.

Labor conditions.—The number of unemployed increased. There was a general reduction of wages for common labor, and it is expected that there will be a drop in the skilled-trade lines.

Farming operations.—Owing to the open, mild weather feeding operations were light. Hay sales were slow and stockmen were buying only as required. Prices ranged from \$6 to \$7 per ton in the stack. Some hay was baled and shipped. The price

to the grower was usually less than when sold in the stack. Considerable clover and alfalfa seed was disposed of at prices ranging from 12 to 16 cents per pound.

Water supply.—The flow of Boise River was about 46 per cent greater than the mean for the past 25 years. Reports from the mountains indicate that the snowfall is about normal as far as depth is concerned, and it is well packed.

Operation and maintenance.—There was little frost in the ground at any time during the month. Roads, however, were nearly impassible, and little maintenance work was undertaken. A few men were used on repairing structures. Water was turned into the Main Canal on the 28th.

Construction.—Owing to bad roads and the saturated condition of the ground excavation on the Notus Canal was carried on with reduced forces. On the rock work on this canal good progress was made. A small crew of Government forces installed several bridges and completed the metal flume across San Run Gulch.

Drainage.—The excavation of the drains in the Riverside and Big Bend irrigation districts was completed. The equipment was overhauled and was being moved to the vicinity of Wilder, where drainage

work will probably be undertaken during the year. The crew installing structures on the drains still had a small amount of work which should be completed during February.

Surveys.—The only field work in progress was confined to the construction and drainage work in progress. Office work consisted of preparing data for the project history and minor studies in connection with project extensions.

F. E. Weymouth, chief engineer, visited the project January 11 to 13.—*J. B. Bond.*

KING HILL PROJECT, IDAHO.

January weather was not favorable for construction work, there being but 11 clear days throughout the month. The total precipitation for the month was 0.68 inch, with a total snowfall of 7½ inches.

No construction work was performed by Government forces. A small force was employed dismantling camps and putting equipment in repair for the next construction season. Hauling sand and gravel for the completion of the Greer flume and lining was continued by Homer W. Greer, contractor. Griffin and Moody completed schedules 1, 3, and 4 of their contract dated October 30, 1920, covering excavation and

Crop report, Boise project, Idaho, 1920.

[Limited to the Government project proper, excluding large areas served under Warren Act contracts or other arrangements.]

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Average per unit of yield.	Total.	Average per acre.
Alfalfa hay.....	45,974	Ton.....	198,459	4.32	\$7.00	\$1,389,210	\$30.22
Alfalfa seed.....	1,031	Bushel....	3,006	2.92	8.40	25,250	24.49
Apples.....	1,319	Pound.....	4,666,622	3.538	.02	93,330	70.76
Barley.....	3,108	Bushel....	90,469	29.11	.60	54,280	17.47
Beans.....	45	do.....	493	10.96	3.60	1,770	39.44
Clover hay.....	7,731	Ton.....	11,385	1.47	7.00	79,695	10.31
Clover seed.....	5,804	Bushel....	24,070	4.15	9.00	216,630	37.32
Indian corn.....	3,835	do.....	172,029	44.86	.80	137,620	35.89
Sorghum corn.....	44	do.....	1,390	31.59	.80	1,112	25.27
Corn, fodder.....	278	Ton.....	2,388	8.59	4.00	9,550	34.36
Small fruits.....	145	Pound.....	141,041	972.70	.10	14,100	97.27
Garden.....	569	Acre.....		\$100.00		56,900	100.00
Hay.....	54	Ton.....	121	2.24	9.00	1,090	20.17
Millet seed.....	9	Bushel....	248	27.56	.80	200	22.04
Oats.....	2,399	do.....	78,662	32.79	.65	51,130	21.31
Onions.....	46	do.....	3,219	69.98	.75	2,414	52.48
Pasture.....	5,857	Acre.....		\$20.00		117,140	20.00
Peaches.....	98	Pound.....	187,585	1,914.14	.06	11,255	114.83
Pears.....	19	do.....	49,400	2,600.00	.02	990	52.00
Prunes.....	458	do.....	1,041,295	2,273.57	.014	18,220	39.79
White potatoes.....	4,386	Bushel....	931,970	212.49	1.15	1,071,760	244.36
Sweet potatoes.....	99	do.....	21,512	217.29	2.00	43,024	434.59
Rye.....	123	do.....	1,249	10.15	1.40	1,750	14.22
Wheat.....	23,460	do.....	750,041	31.97	1.65	1,237,570	52.75
Pop corn.....	88	do.....	4,720	53.64	3.00	14,160	160.91
Sweet corn.....	7	do.....	180	25.71	2.50	450	64.29
Lettuce.....	14	do.....		\$200.00		2,800	200.00
Less duplicated areas.....	6,300						
Total cropped acreage.....	100,700		Total and average.....			4,653,400	46.20
			Areas.		Acres.	Farms.	Per cent of project.
Irrigated, no crop:							
Nonbearing orchard.....			194				
Young alfalfa.....			6,110				
Young clover.....			574				
Ground, fall plowed.....			1,509				
Miscellaneous.....			684				
Less duplicated areas.....			11				
Total irrigated acreage.....	109,760						
			Total irrigable area farms reported.....		118,687	2,652	82.9
			Total irrigated area farms reported.....		109,760	2,652	76.7
			Irrigated under water-right applications.....		104,183		72.8
			Irrigated under rental contracts.....		5,577		3.9
			Total cropped area farms reported..		100,696	2,652	70.4

backfill at Cassia and Tuanna siphons. Repairs to Snake River Bridge at King Hill were completed by the Minneapolis Steel & Machinery Co. under a joint contract with the United States and Elmore and Owyhee Counties.

The King Hill Irrigation District had their maintenance force engaged in cleaning canals and repairing wooden structures.—*Walter Ward.*

MINIDOKA PROJECT, IDAHO.

On the South Side pumping unit a carload of cement was received in January and unloaded for use in concrete work on operation and maintenance replacements. Negotiations were in progress to obtain the cooperation of the Bureau of Fisheries with a view to stocking the Snake River from Milner to the mouth of the Blackfoot River with food fishes. Quite a number of cars of potatoes were sold during the month which netted the farmers 50 cents a hundred.

Chief Engineer Weymouth visited American Falls on the 17th and Examiner of Accounts Bickel spent from the 6th to the 20th on the project. At American Falls appraisal of buildings and lands in the business district was in progress. Surveys at American Falls were continued.

Three 400 kva. Wagner transformers, received for the Burley substation enlargement, were dried out and placed in the substation on January 30. The three 350 kva. transformers which were removed will be taken to the Rupert substation as soon as the weather will permit.—*Barry Dibble.*

HUNTLEY PROJECT, MONTANA.

January weather was mild throughout.

The principal work by the field force was the repair of equipment and pumping plants. The hydraulic pumps were completely dismantled and thoroughly rebuilt. Some work was also done on the engines of the auxiliary pumping plant.

An Austin one-half-yard dragline arrived on the 17th and was unloaded on the 19th. This machine is to be used on operation and maintenance work principally, cleaning ditches, drains, etc.

The office force completed the assembling of the project history.

On January 22 the project manager met with the water users of the second division, at Pompeys Pillar to discuss plans for obtaining drainage for this di-

vision. No constructive program was presented, however, by those attending, and the meeting was adjourned without definite results.

Little work was being done during the month and labor conditions were easy.

Farmers still had large quantities of hay on hand, and it was practically impossible to dispose of this product. The railroads granted approximately a one-half freight rate to markets, but this did not seem to relieve the situation materially. Baling was being done for \$4 per ton and wire furnished. The prevailing price of alfalfa hay was \$5 per ton.

The project manager was in conference with the district counsel at Helena from the 3d to the 5th.—*Wm. M. Green.*

MILK RIVER PROJECT, MONTANA.

January weather was unusually mild. Practically no snow fell during the month and the ground was practically bare at the end of the month. Labor supply was ample.

Construction by contract.—Work was nearly completed on the office building at Saco, continued on a three-room cottage at Vandalla Dam, and commenced on a lodging house at Saco. No earthwork was in progress. Specifications for enlargement of Nelson Reservoir from 27,000 to 70,000 acre-feet capacity were issued and bids will probably be opened the latter part of April for this work.

Construction by Government forces.—An addition to the Malta garage was built.

Operation and maintenance.—Repairs were made to the flume near Dodson. Ice was put up at Wagner and Paisley. A small drag line was received from the makers and unloaded. Part of the operation force was utilized on bench level and river bank surveys throughout the month.—*Geo. E. Stratton.*

ST. MARY STORAGE UNIT.

Away from the mountains moderate weather prevailed during January, with temperatures above normal and light precipitation. At Sherburne Lakes Dam considerable snow fell, but the total for the year was below normal.

No construction work was undertaken and neither St. Mary Canal nor Sherburne Lakes Dam was operated. All field camps were in charge of caretakers, whose time was occupied in caring for stock, making repairs to buildings, general camp maintenance, and

Estimated irrigation and crop results, Boise project, Idaho, 1920.

(For lands other than reported on regular crop report.)

Name of water user (irrigation district, company, etc.).	Irrigable acreage.	Irrigated acreage.	Harvested acreage.	Value of crops.		Approximate per cent of total water used supplied by United States.
				Total.	Average per acre.	
Nampa and Meridian Irrigation District 1.....	48,785	45,000	44,000	\$1,980,000	\$45.00	58
Pioneer Irrigation District.....	34,400	32,000	31,500	1,386,000	44.00	26
Settlers' Irrigation District.....	12,000	11,200	11,100	500,000	45.00	10
New York Canal Co.....	21,500	19,000	18,000	720,000	40.00	54
Farmers' Union Ditch Co.....	8,100	6,800	6,700	268,000	40.00	12
Farmers' Cooperative Ditch Co.....	15,500	13,400	13,100	550,000	42.00	8
Total and average.....	140,285	127,400	124,400	5,404,000	43.50	37.3

¹ About 50 per cent of the land received its entire supply from Government water. The balance received a supplemental supply.

similar work of this nature. At the headquarters camp installation of the electric lighting system was completed and the plant put in operation.

On January 25 Project Manager R. M. Snell was summoned to Washington for a conference in connection with appropriations for the Blackfeet project, Engineer R. K. McComb being in charge of the St. Mary storage unit during his absence.—*R. K. McComb.*

SUN RIVER PROJECT, MONTANA.

Unusually mild weather prevailed during January. At Pishkun Reservoir excavation of the connecting ditches between ponds was completed with the exception of about 1,200 cubic yards in the bottom of one drain. There remained at the end of the month to complete this work the placing of about 500 cubic yards of gravel facing on dike No. 3, riprapping of dike No. 4, and building of wasteway structure. Three timber measuring weirs were installed in Big Coulee and rock and debris cleaned out of the wood-stave pipe at Sun River Crossing. The average force comprised 17 men, 20 teams, and one 2-ton truck.

On the Fort Shaw Division a small crew was employed at the main canal headworks repairing crib No. 2 and protection work to river bank above crib No. 1. A small crew was employed during the greater part of the month resetting rotted poles on the telephone line between Willow Creek and Sun River diversion. No water was run in the canal system.

Farmers were employed burning weeds, repairing fences, baling hay, and marketing farm products. On account of lack of demand and low prices, carload shipments of hay, grain, and potatoes were comparatively light. Winter wheat was reported badly damaged by the dry, windy weather.

There were shipped during the month from Fairfield, 9 cars wheat; from Simms, 6 cars wheat, 12

cars hay, 1 car sheep, and 4 cars potatoes; from Fort Shaw, 24 cars hay and 1 car of emigrants and stock; total shipments from project, 57 cars.—*Geo. O. Sanford.*

LOWER YELLOWSTONE PROJECT, MONTANA-NORTH DAKOTA.

January weather was favorable for such maintenance work as was being carried on and ideal for range stock. There was only one-half inch of snow-fall and the mean temperature of 21.9° was 11° above the average for 15 years.

Dragline excavators Nos. 1 and 3 were being repaired for this season's operation. The small maintenance crew on district No. 1, in addition to cutting brush along the main canal, was engaged in gathering willow brush to be used in riprapping the banks of Beef Slough waste channel. On district No. 2 the maintenance force, when not engaged in making surveys for lateral revisions, was cutting willow growth along the main canal in the Ridgeland district.

The canal riders completed securing crop data and assisted the office engineer in compiling the statistics. The office engineer and superintendent of district No. 2, when not engaged in field surveys, were working up data on crop reports and the office engineering work in connection with lateral and canal extensions.

The directors of irrigation district No. 2, in compliance with the law for calling an election for the landowners to vote upon the proposed contract, have set the date of election for February 19.

A. B. Gale, master mechanic, was engaged from the 14th of the month in supervising the unloading and assembling of dragline excavators on the Fort Peck and Milk River projects. Both these machines were moved several miles from the siding.—*L. H. Mitchell.*

Irrigated crop report, Lower Yellowstone project, Montana-North Dakota, 1920.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Average per unit of yield.	Total.	Average per acre.
Alfalfa.....	7,030	Ton.....	14,020	2.0	\$12.00	\$168,240	23.93
Alfalfa seed.....	15	Bushel.....	15	1.0	15.00	225	15.00
Barley.....	519	.....do.....	13,629	26.3	.70	9,540	18.38
Beans.....	44	.....do.....	593	13.3	3.00	1,780	40.43
Beets, sugar.....	658	Ton.....	6,594	10.0	13.00	85,720	130.28
Corn.....	289	Bushel.....	8,523	29.5	.80	6,820	23.59
Corn fodder.....	174	Ton.....	990	5.7	9.00	8,910	51.20
Flax.....	671	Bushel.....	5,172	7.7	1.80	9,310	13.89
Garden.....	107	.....	.....	.....	.....	13,600	127.10
Hay.....	825	Ton.....	962	1.1	10.00	9,620	11.66
Oats.....	2,141	Bushel.....	73,803	34.4	.60	44,280	20.68
Pasture.....	416	.....	.....	.....	.....	4,330	10.40
Potatoes.....	174	Bushel.....	24,175	139.0	1.00	24,175	138.93
Wheat.....	6,042	do.....	111,065	18.4	1.75	194,350	32.16
Miscellaneous.....	73	.....	.....	.....	.....	3,800	52.06
Less duplicated areas.....	58	.....	.....	.....	.....	.....	.....
Total irrigated and cropped acreage.....	19,120	Total average.....	.....	.....	.....	584,700	30.60

Areas.	Acres.	Farms.	Per cent of project.
Total irrigated area farms reported.....	38,290	492	91
Total irrigated area farms reported.....	19,100	375	45
Irrigated under water right applications.....	1	1	.....
Irrigated under rental contracts.....	19,099	374	45
Total cropped area farms reported.....	27,123	492	64

¹ Includes \$1 per ton for top.

² Irrigated and dry farmed.

NORTH PLATTE PROJECT, NEBRASKA-WYOMING.

January weather was unusually fine for a winter month until the 24th when a heavy snowstorm occurred followed by colder weather. The ground had not been frozen enough to stop construction work. The mean temperature for the month was 3.6 degrees above the normal for January.

Operation.—One hundred second feet was released from the Pathfinder Reservoir on the 12th and the discharge continued for the remainder of the month, and the water used by the city of Casper to dilute the normal flow for city consumption.

The Fort Laramie Canal was operated as far as mile 25.5 to furnish water for the Lingle power plant. No particular difficulties were encountered in operating.

Maintenance.—Little maintenance work was done except the usual camp maintenance and repairing of equipment. Monighan dragline No. 4 continued work on the widening of the Interstate Canal and strengthening its banks. The machine was operated two shifts daily and moved 25,690 cubic yards of material, or 547 cubic yards per shift.

Crops.—There was little movement of crops and apparently little market. The crops shipped were as a rule sold at prices less than the cost of production.

Live stock.—There was practically no activity along live stock lines.

Drainage.—Monighan dragline No. 3 completed the excavation of the Dunham-Andrews Drain on the 14th. The total excavation for the month was 11,838 cubic yards, or 312 cubic yards per shift. No work was done on the Lower Nine Mile outlet, as dragline No. 2 was being overhauled.

On the Fort Laramie unit electric dragline No. 131,313 continued work on the Cherry Creek Drain, operating with two shifts daily and excavating 37,244 cubic yards of material, or 690 cubic yards per shift. The bridge at station 727 of this drain was completed.

Construction.—Storage unit: Good progress was made on the excavation for the new north tunnel outlet. The main tunnel was holed through and the drilling completed to enlarge 55 feet to the full section. The heading in conduit No. 1 was carried in 25 feet. Drilling and grouting operations were continued to stop leakage into the gate shaft and in the north wall of the canyon; 798 sacks of cement were used and about 90 per cent of the leakage into the shaft was stopped and 95 per cent of the leakage on the face of the canyon wall. Preparations were under way to begin concrete work. The last shipment of valves and emergency gates arrived at Casper on the 14th and a greater part has now been hauled to the dam.

Fort Laramie unit: Electric dragline No. 131,312 continued work on the East Springer Lateral, operating with two shifts daily, excavating 18,485 cubic yards of material and completing 1.43 miles of lateral. Dragline No. 131,343 continued work on the Fort Laramie Canal, operating with two shifts daily, excavating 30,810 cubic yards of material and completing 0.52 mile of canal. Dragline No. 131,345 continued work on the Fort Laramie Canal, excavating 26,200 cubic yards of material and completing 0.6 mile of canal. Dragline operations were hindered somewhat by the frozen ground during the latter part of the month.

The new Austin No. 4 dragline, project No. 121,150, began work on the excavation of the wasteway at mile 25.5 on the 10th. During the working period this machine excavated 3,269 cubic yards of material, of which 730 cubic yards were class 2.

The powder crew drilled 3,440 linear feet of holes and used 4,625 pounds of T. N. T. and 45 pounds of dynamite in blasting classified material for the draglines.

The construction forces at the Cherry Creek and Fairview camps working on canal and lateral structures accomplished an unusually large amount of

Nonirrigated crop report (irrigable land), Lower Yellowstone project, Montana-North Dakota, 1920.

Crop.	Area acres.	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Average per acre.
Alfalfa.....	915	Ton.....	747	0.8	\$12.00	\$8,964	\$9.80
Alfalfa seed.....	550	Bushel.....	308	.6	15.00	4,624	8.41
Barley.....	377	do.....	8,279	22.0	.70	5,795	15.37
Beans.....	2	do.....	10	5.0	3.00	30	15.00
Beets, sugar.....	11	Ton.....	2	.2	13.00	26	2.36
Corn.....	388	Bushel.....	7,573	19.5	.80	6,058	15.61
Corn fodder.....	118	Ton.....	290	2.5	9.00	2,610	22.12
Flax.....	1,327	Bushel.....	8,656	6.5	1.80	15,581	11.74
Garden.....	20					1,300	65.00
Hay.....	698	Ton.....	664	1.0	10.00	6,640	9.51
Oats.....	1,024	Bushel.....	32,282	31.6	.60	19,370	18.91
Pasture.....	308					1,577	5.12
Potatoes.....	36	Bushel.....	3,763	104.5	1.00	3,763	104.53
Wheat.....	2,045	do.....	25,621	12.5	1.75	44,850	21.92
Miscellaneous.....	181					5,712	31.00
Total dry farmed and cropped acreage.....	8,000	Total and average.....				126,900	15.85

Areas.	Acres.	Farms.	Per cent of project.
Total irrigable area farms reported.....	38,290	492	91
Total irrigated area farms reported.....	(1)	(1)	(1)
Under rental contracts.....	(2)	(2)	(2)
Total cropped area farms reported.....	27,123	492	64

¹ Dry crop only.

² See preceding table.

³ Irrigated and dry farmed.

work for a winter month, the weather being favorable for concrete work a greater part of the month.

Northport District: Electric dragline No. 131344 continued work on the Northport Canal operating with two shifts daily, excavating 33,410 cubic yards, of material and completing 1.02 miles of canal.

The construction of the West Indian Creek Siphon was completed and work begun on the Indian Creek Siphon.

Fair progress was made by the contractors at work on lateral excavation.

Power system.—The Lingle Power Plant was operated continuously throughout the month with three shifts daily with the exception of the 16th and 17th.

While draining the penstock on the 16th a vacuum was created which caused the collapse of about 80 feet of the upper end of the penstock. Repairs were effected with the loss of only 31 hours of operating time.

In addition to the power used for construction purposes, 2,300 kilowatt hours were delivered to Lingle, Wyo., 30,500 kilowatt hours to Torrington, Wyo., 10,200 kilowatt hours to Morrill, Nebr., and 35,500 kilowatt hours to Mitchell, Nebr.

Surveys.—The irrigable area surveys for the land in the Upper Cherry Creek Valley were begun and the surveys were continued on irrigable areas under the Springer lateral system. On the Northport unit the Indian Creek and Dugout Creek drains were located and profiles taken.

General.—A board of engineers was convened on the 12th and was in session until the 19th. The board consisted of Assistant Chief Engineer C. P. Williams, Drainage Engineer J. L. Burkholder, Project Manager Andrew Weiss, and Assistant Project Manager H. W. Bashore.

Reports were prepared on the solution of problems in connection with the drainage work on the Interstate and Fort Laramie units.—*H. C. Stetson.*

NEWLANDS PROJECT, NEVADA.

Favorable weather prevailed during January.

Assistant Chief Engineer R. F. Walter spent January 7 and 8 on the project investigating conditions in connection with the serious break in the Truckee Canal, which occurred on the morning of the 2d.

On January 10 a meeting was held by the board of directors of the Truckee-Carson irrigation district for preparation of drainage assessment and other district matters for presentation to the court on February 1 for confirmation proceedings; the project manager and district attorneys were in attendance.

On January 12 the district court in a hearing for confirmation of the district organization and plans for assessment of drainage benefits ordered continuance, until February 1, 1921, at the request of Attorneys P. A. McCarran and William Kearney, representing a faction in opposition to the irrigation district.

On January 24 Chief Engineer F. E. Weymouth, Consulting Engineer D. C. Henny, and Engineer James Munn joined the project manager and Engineer Ferd Bonstedt in Reno, Nev., for investigation of the proposed Spanish Springs reservoir site and preparation of a board report covering the feasibility and desirability of development of this site for storage of Truckee River waters. This work was completed January 28.

On January 26 a fraction of the project water users in opposition to the irrigation district organization and to the plans for assessment of drainage benefits started the circulation of petitions for the dissolution of the Truckee-Carson irrigation district. As a result of this movement a mass meeting was held by the

Churchill County Commercial Club on January 29 for the discussion of these matters. Attorneys and others representing both the opposition and the irrigation district debated the subject.

Construction.—As the drag-line excavator was in use for repair of the break in Truckee Canal, no improvement work on the canal was in progress.

Estimates and reports in connection with Truckee River storage in the proposed Spanish Springs and King Reservoir sites were completed and used by a board of engineers which met in Reno January 24 to 28.

Surveys were made for several minor extensions to the lateral system in the Fallon division.

About 9 miles of levels were run to determine work necessary to protect the railroad grade of the Tonopah and Goldfield branch of the Southern Pacific Co.'s railroad in section 20, T. 18 N., R. 25 E., in case the filling of Lahontan Reservoir will be possible this summer.

Irrigable area surveys were made covering about 480 acres in the Fallon district for the placing of new lands on the plats.

Settlement.—One homestead filing, covering 72 acres of irrigable land, was accepted during the month.

Water supply and use.—Lahontan Reservoir storage amounted to 140,400 acre-feet at the end of January. A net rise of 0.10 was recorded in Lake Tahoe.

Owing to the breaking of Truckee Canal only small flows were carried in the canal, for the operation of the Lahontan power plant following the partial repair of the break.

Snowfall at Summit, Calif., was recorded at 120 inches in depth on January 31. The maximum depth was 130 inches.

Operation and maintenance.—On January 2, 1921, a serious break occurred at station 1098, Truckee Canal, at the same point where the canal broke in 1916. An interruption of about five days in the delivery of water through the canal was occasioned, resulting in a shutdown of Lahontan power plant during that time. A new piece of canal about 1,000 feet in length was excavated by way of repairs, which required the removal of about 20,000 cubic yards of material. Monaghan dragline excavator No. 3, which was carried into the channel of the break, was repaired and did the greater part of the work of excavating a new canal section.

Other maintenance work consisted of cleaning about 3,500 linear feet of the H Lateral, using dragline No. 4 and the cleaning of about 3.25 miles of other laterals, using teams. Willows were cleared from about 8 miles of laterals in the various districts and about 3,000 square yards of brush riprap were placed in the V Canal.

Six new minor timber structures were installed by the maintenance force and numerous structures were repaired.—*John F. Richardson.*

CARLSBAD PROJECT, NEW MEXICO.

The weather during January was warm and pleasant with practically no low temperatures. The total run-off of the Pecos River amounted to 17,450 acre-feet or an average of 560 acre-feet per day. The maximum flow was 349 second-feet and the minimum 238 second-feet.

Operation and maintenance work comprised general cleaning and repair work of the entire system incident to this time of year. One small sublateral was constructed. In addition, several headgates and weirs in the Malaga district, which were constructed to serve second-unit lands recently subdivided, were

also completed. One force was employed in making repairs on the concrete section of the Main Canal where water pressure had caused heaving of the concrete and where the concrete was defective on account of excessive seepage during the construction period. This repair work was confined principally to the bottom and the west bank.

Labor was plentiful for all work and considerable idle labor was in evidence on the streets. The dragline machine purchased from the Austin Machinery Corporation Co. was received on the project January 27. This machine will be used principally in cleaning open drains and on canal and lateral maintenance.

Shipments of the project produce were in progress during the entire month. There were 3,703 bales of cotton shipped, destination principally the New Orleans market, to be sold upon arrivals. Three carloads of grain, 19 of alfalfa hay, 5 of cotton seed, and 3 carloads of alfalfa seed were also shipped from the project. Practically no sales of cotton were made on the project. The amount of cotton ginned to the end of January amounted to 6,613 bales. The cotton picking was nearly complete at the end of the month. Project collections on operation and maintenance and construction charges were very small during the month. In spite of the rather stringent financial condition existing throughout the farming area there was considerable activity in preparing land for next season's crop. Several thousand acres of land were being prepared to be planted during February to small grain. The small force of men employed by the Federal Horticultural Board was still on the project searching for the pink boll worm.—*L. E. Foster.*

RIO GRANDE PROJECT, NEW MEXICO-TEXAS.

The weather was warm for the month of January with only 0.06 inch of precipitation. Ideal working conditions prevailed, as not one day was lost on account of weather.

The inflow at San Marcial amounted to 39,000 acre-feet. The amount of water stored in Elephant Butte Reservoir was 1,751,367 acre-feet, which is the greatest amount for any month of January in the history of the reservoir.

Contractors for lateral cleaning had about completed the contracts and the majority of the laterals will be ready for water on February 15.

A large acreage was being planted to spring wheat and the farmers will require water at once, as the winter has been very dry with almost no precipitation. In the El Paso Valley about 10,000 acres will be seeded to cotton.

The work of cleaning the Franklin Canal was begun with 150 two-horse teams, and about 30,000 cubic yards will be moved.

Farm residences, with all modern conveniences, have recently been completed in the Mesilla Valley by Dr. J. E. Craft and Mr. J. W. Jackson.

No irrigation water was delivered during the month. During the nonirrigation season, besides accomplishing the annual canal and lateral cleaning on maintenance, a maximum amount of reconstruction work has been gotten under way. Considerable more of this class of work is being accomplished this year than during any season heretofore.

Practically all of the canal cleaning is being done by small contracts, 37 of such contracts being in operation on the removal of 139,000 cubic yards of sand and silt and the cleaning of 75 miles of banks. However, a considerable quantity of this work is being done by Government forces.

At Elephant Butte the cut-off toe wall was completed and hydraulic sluicing on the spillway channel was carried on throughout the month.

In the Rincon Valley construction progressed on the Garfield Drain and the construction of three additional checks in the main canal.

In the Mesilla Valley the only drainage construction in progress was on the Del Rio Drain, where a record of 74,000 cubic yards was made by two shifts operating on the Monighan 2-T excavator. Construction and reconstruction work in the Mesilla Valley consisted of the operation of one Bucyrus excavator on the Leasburg Canal extension No. 2, the operation of a second Bucyrus drag line excavator on the Chamberino Lateral enlargement, and a third Bucyrus dragline excavator on the West Side Canal extension, and seven contract outfits on the Canutillo Canal, which constitutes the lower end of the West Side Canal extension. Nineteen concrete structures were installed on the above canals. Rapid progress was being made on the construction of the Montoya Siphon.

In the El Paso Valley the enlargement of the Franklin Canal head gates and construction of said sluicing gates was well under way, and work was begun on raising the banks of the Franklin Canal from heading to station 315. All structures in the Franklin Canal between Franklin Feeder Canal and Island Feeder Canal were being enlarged and the Island Main Lateral was being enlarged to station 207. About 200 teams were working on the Salatral Lateral under the Lee Moor Contracting Co. contract. The Crismore Lateral is being constructed by Government forces. Drainage construction progressed with the operation of one Bucyrus drag line excavator on the Fabens Drain and one on the Playa Drain. The Jermings Construction Company erected their excavator to begin excavation of schedule No. 2 of the Tornillo Drain.

Irving Harris, consulting engineer, whose employment by the city of El Paso and the two irrigation districts of the project to investigate and report on the possibilities of obtaining power for municipal and general purposes in El Paso and vicinity was mentioned in the last report to the Record, made a trip to Elephant Butte Dam accompanied by the project manager, district counsel, the manager of the El Paso County water improvement district No. 1, Roland Harwell, and the directors of the district, on January 4 and 5. The purpose of the trip was to examine conditions as they exist on the ground where the power would be produced and to consider the advisability of joint action toward the establishment of the plant for the furnishing of power for the purpose mentioned.—*L. M. Lawson.*

NORTH DAKOTA PUMPING PROJECT.

North Dakota's unusual winter continued throughout January. There was less than an inch of snowfall and only 0.15 inch of precipitation. The highest temperature was 44° and the lowest —8°. The average temperature was 12.2° above normal. It has been the mildest winter in the records.

Repairs to the pumping barge were continued. In the power house it became necessary to practically dismantle the 50 kilowatt exciter set in order to replace a worn bushing and governor parts of the Lycoming engine. Other maintenance consisted simply of that normally incident to upkeep during operation.

The power plant was operated for the commercial power contract; 103,650 kilowatt hours of electrical energy were delivered to the city of Williston. This was 2,950 kilowatt hours less than was delivered in

the same month of last year. The return from the power plant, however, was \$942.75 more than for the same month a year ago, due to the new rates which became effective January 1 and to some reduction in coal-mining cost.

Nine hundred and ninety-five tons of coal were mined.—*Wm. S. Arthur.*

UMATILLA PROJECT, OREGON.

January was cloudy, with normal precipitation and a temperature considerably above normal.

Farming operations.—Some land leveling was done and a little hay baled and shipped. Farmers were principally occupied in routine work. There were 65 carloads of baled alfalfa hay shipped during the month and a little over 4 tons of honey.

Labor conditions.—Owing to the fact that little work was in progress, labor conditions offered no difficulty. It is expected that when construction and maintenance work is in full swing about the first of March the local labor supply will be adequate. On January 10 a new wage scale was announced as follows:

Laborer, \$3.28 per day (base).

Teamster, 2-horse, \$6.80 per day.

Teamster, 4-horse, \$10 per day.

Should conditions change materially a further reduction in scale may be possible.

Operation and maintenance.—The feed canal was operated continuously throughout the month. From 236 to 273 second-feet were diverted, of which from 5 to 38 and from 182 to 241 second-feet were delivered to the Echo Mills and Cold Springs Reservoir, respectively. There were no difficulties in the operation of the canal, this being the rare year when continuous operation throughout the month of January has been possible because of freedom from ice conditions. On January 31 the available storage in Cold Springs Reservoir was 45,500 acre-feet. This is the best storage record for this period of the season which has ever been reported. On the East Side from four to eight men were employed intermittently as weather conditions permitted on repairs to structures, drainage at Cold Springs Reservoir, and the cutting of willows and locust sprouts. On the West Side a crew of three to five men was employed intermittently in sluicing on the main canal and on miscellaneous repair work.

Construction.—The only small construction work done during the month was on supplemental construction districts Nos. 34 and 31. On district No. 34, 45 cubic yards of sand and gravel (pit) were screened and hauled to the line. Three farm turnouts were installed. On district No. 31 work was intermittent, owing to weather conditions. Approximately 400 feet of old pipe were taken up on the old B-2 lateral, of which 231 linear feet were relaid.

Visitors.—On January 8, J. G. Camp, manager of the King Hill irrigation district, Idaho, called at the office. Watermaster Awbrey E. Perry visited the project office on January 27 in connection with regulating the water of the Umatilla River.—*Maurice D. Scroggs.*

KLAMATH PROJECT, OREGON-CALIFORNIA.

No water for irrigation was run in any of the project canals during January. The Diversion Canal, however, was operated at maximum capacity all month diverting water from Lost River to the Klamath River.

A portion of the project grain crop still remained to be thrashed. Considerable stock was being pastured on the Tule Lake grain lands. Owing to the open winter, little hay was being fed to stock.

Two small crews were employed during the month on regular maintenance work; one crew was engaged in cleaning laterals, and one in repairing timber flumes in Poe Valley.

On the C Canal flume job a crew of about 18 men was employed. The principal work consisted in receiving material, building forms for the flume, and opening a rock quarry for concrete materials.

Tentative paper locations were being made on the topographic sheets for the J Canal and lateral system. The system is designed to serve an area of about 24,000 acres that is being made bare by the recession of the waters of Tule Lake. No field surveys were made during the month.

The designs for the forms for the present flume on the C Canal have been completed and the work of planning the plant layout and equipment for constructing the flume was in progress.

Monaghan excavator No. 122235 worked from the 1st to the 10th on Van Brimmer Drain No. 2, constructing 1,265 linear feet of drain which involved the excavation of 5,821 cubic yards of material. During the remainder of the month the machine was idle on account of a broken gear. The new dragline excavator, No. 121248, a type 30-B Bucyrus machine with a capacity of one-half cubic yard, with 50-foot boom, was received on the project on January 15.

W. A. Meyer, chief clerk, has been promoted to the position of examiner of accounts with headquarters in Denver. Mr. Meyer will take up his new duties about February 10. N. G. Wheeler has been transferred from the North Platte project and will succeed Mr. Meyer as chief clerk. R. S. Lieurance, assistant engineer, has been transferred from the Denver office.

The First State & Savings Bank closed its doors on January 12.—*Herbert D. Newell.*

BELLE FOURCHIE PROJECT, SOUTH DAKOTA.

Except for a light storm from the 24th to the 27th the weather in January was ideal and roads were exceptionally good. The only moisture occurring was in the form of snow and the total depth was about 5 inches.

The diversion canal was run continuously through the month and carried 10,475 acre-feet out of a total of 12,646 acre-feet of flow in the river. The total gain in storage for the month amounted to a little more than 10,000 acre-feet. No other canals were operated. Little work was done by the maintenance forces. A small party working out of Newell completed substructure repair on the Horse Creek Flume and hauled about 60 yards of gravel for concrete structure repair; two teams were employed a portion of the month hauling loose rock for riprapping below the flume. From the Vale Camp a repair crew worked on Stinking Water Flume and replaced decayed timbers of seven bents in the north line of the flume. About three-fourths of a car of cement was hauled and stored at the point where concrete lining is to be made in the South Canal just below the tunnel. Several days with one team were spent in hauling lumber to the Vale Camp. Considerable work was done in repairing equipment and getting it in shape for spring use.

Engineer Towle was employed during the month in the office working on designs and estimates for Willow Creek extension and assisting in compiling data

or the project history and operation and maintenance report. Henry B. Meyer, foreman from Vale, also spent half of the month in the office at Newell working on the operation and maintenance report.

The No. 206 P. & H. dragline arrived on the 10th and was placed in the yard. As soon as weather conditions are favorable it will be put in service cleaning out certain drains and canals, and unless found advisable to change to Willow Creek extension work will be employed throughout the summer cleaning canals. The Austin bucket machine is supposed to arrive in April, and it will be put into service cleaning small laterals also. As soon as advertisements for the Willow Creek extension work have been issued preparations will be made and a force organized for building and placing the Willow Creek Siphon, a structure designed of 54-inch lock-joint pipe about 6,200 feet long. Other concrete and wooden structures will be let by contract if satisfactory bids can be secured.

Marketing of crops was stagnant and little hay or wheat was shipped. The price of baled alfalfa f. o. b. cars is \$8 a ton and practically no market for it at that figure. Owing to an almost complete failure of the small grain crops together with the lack of a market for hay above the cost of baling and hauling, and the further fact that herds of cattle and other live stock have been heavily depleted, the farmers find themselves financially in the worst condition they have experienced for a good many years. What live stock there is on the project is in first-class condition and the consumption of hay has been light owing to the very open and warm winter. Most herds, however, are low, considerable stock having been sold last fall to meet necessary obligations at banks.—*B. E. Hayden.*

STRAWBERRY VALLEY PROJECT, UTAH.

January weather was comparatively mild with average precipitation.

Labor conditions.—Common and skilled labor were plentiful with a downward trend in wages.

Operation and maintenance, storage works.—Work on repairs to Strawberry Tunnel progressed satisfactorily. During the month 2,060 linear feet of tunnel floor were reconcreted and 21 concrete bays put in at station 30. The crushing and concrete mixing plants were operated successfully and 202 cubic yards of concrete manufactured.

Health conditions at the camp were excellent.

Hydroelectric power plant operations.—The power plant was operated without serious interruption during the month and power furnished to the towns of Spanish Fork, Payson, Salem, and Springville.

Shipments of exciter turbine repair parts were being received at the power plant.

The telephone and transmission lines were operated without trouble.

Settlement.—Three supplemental water-right applications were received during the month under the High Line unit.

General.—The snowfall data on the watershed in Strawberry Valley indicate that the run-off into Strawberry Reservoir during the coming spring will at least fill the reservoir, with a possibility of part of the run-off being wasted over the spillway at Strawberry Dam.

Engineers have been designated by the Utah County drainage district No. 4 to investigate and report to the board of directors the general plan of drainage.

Acting Chief Engineer R. F. Walter and Engineer James Munn visited the project on January 3 and 4

in connection with the repairs to Strawberry Tunnel—*W. L. Whittemore.*

OKANOGAN PROJECT, WASHINGTON.

The precipitation for January was above normal and amounted to 2.93 inches at Omak and 2.64 inches at Conconully. The temperature records indicate that the month was warmer than usual.

The setting of the machinery in the machine shop was completed early in the month. The work of wiring and installing the transformers for power and light was completed. The Duck Lake engine was moved down from Conconully about the middle of the month and has been placed on its old foundation. The cylinders from this engine were brought to headquarters and some repairs were being made together with the general cleaning. The mechanical work was handled for the most part by the master mechanic and one helper with the occasional help of two other men when necessary. Two men who are employed on the project as water master and foreman were employed practically steadily on the repairs to small tools and equipment and the hauling of gravel for the replacement of minor structures throughout the month.

The mildness of the winter allowed outside work to be carried on, and the need for such work is imperative in order that the distribution system and equipment be put in shape for the coming season. The inflow into Conconully Reservoir for the month amounted to 249 acre-feet. The snowfall at Conconully for the month amounted to 35.3 inches with 33 inches of good solid snow on the ground at the end of the month. From Forest Service reports, 81 inches of snow have fallen at Conconully since October 1, which seems to indicate a large run-off with plenty of water for the irrigation season.

Very few apples have been sold, owing to the low price; however, during the month, the price rose somewhat, an increase of 25 cents per box on wine-saps being offered. The price of hay declined with the general lowering of prices and hay could be had for \$20 per ton in the stack. Considerable hay was being shipped in from Yakima and other points in the State to take care of the stock.—*Calvin Cgsteel.*

YAKIMA PROJECT, WASHINGTON.

The prevailing temperature during January was about normal, with snowfall above the average. The depth of snow at the reservoirs at the close of the month was as follows:

Keechelus, 68 inches; Kachess, 43 inches; Cle Elum, 30 inches; Bumping, 62 inches.

Operation and maintenance, Sunnyside unit.—Maintenance work consisted of placing gravel riprap on main canal slopes, grubbing willows, overhauling telephone line, and general repair work. Drilling of well for domestic water supply at patrol house, 51-mile, was completed. Good progress was made, the riprapping on the Grandview division being completed, and that on the Zillah division nearly completed.

Tieton unit.—Plaster lining of North Fork Tunnel was completed on the 22d. Repair and replacement of small concrete pipe lines was completed on the 10th by a maintenance crew of four men; this crew being then transferred to work on installation of plumbing and lighting fixtures for the two new cottages at Tieton headquarters, and extension and enlargement of the sewer system. The ditch riders were employed throughout the month on repairs to telephone lines,

cutting and grubbing willows on main and sublaterals, repairing and rebuilding fences at patrol sites, and cleaning out and widening rock sections at points along Lateral G within patrol districts 5, 6, and 7.

Investigation and surveys for new units.—Surveys and estimates were continued for the Roza and Moxee units. Location of main canal for Roza unit was completed to the boundary between Yakima and Benton County. Studies in the office included estimates for an all-pumping scheme for the Roza unit, and revision of estimate for the Moxee unit with a view to reducing the size of the main canal. Digging of test pits was continued on the Roza line.

Miscellaneous.—The project manager met the chief engineer at Salt Lake City on January 23 for conference, and visited the Strawberry Valley project on January 26 and 27. Assistant project manager, J. G. Heinz, of the Sunnyside unit, visited the North Platte project on January 15 to 18. H. N. Bickel arrived at Yakima to establish headquarters, replacing F. G. Hough, examiner of accounts, who has resigned from the Service.

Labor.—There has been a large number of unemployed men in the valley throughout the winter, and during the past month they have organized and are conducting a free lunch room for all those without means of subsistence. The lunch room is maintained by voluntary contributions of food and supplies.—*J. L. Lytle.*

RIVERTON PROJECT, WYOMING.

The temperature during January was about normal and was unusually uniform throughout the month. There was practically no precipitation. The roads were in good condition.

Drag lines Nos. 22 and 23 were both operated two shifts. These machines excavated from the Wyoming Canal a total of 24,367 cubic yards, of which 3,330 cubic yards were excavated from outside the canal prism. Of the total material moved, 15,050 cubic yards were class 1, being a heavy gravel; 3,813 cubic yards, class 2, a hard, sandy shale; and 5,504 cubic yards sandstone, requiring blasting. Drag line No. 22 was excavating on the second cut digging to grade, the material moved being principally gravel, except about 3 feet of shale and sandstone in the bottom of the cut. Drag line No. 23 was stripping gravel from the uneven surface of the sandstone during the early part of the month and later was excavating sandstone.

Project Manager H. D. Comstock was confined to the hospital until January 22, after which he attended to his usual duties.—*H. D. Comstock.*

SHOSHONE PROJECT, WYOMING.

The unusually mild weather continued throughout January. There was little precipitation. As a result, all seasonable outdoor work could be prosecuted to advantage.

Water supply.—The lowering of the Shoshone Reservoir by means of the balanced valve control was under way from January 18 to 22. On the latter date it was necessary to close the valves in order to prevent serious damage near Kane, at the mouth of the river.

Operation and maintenance.—Owing to the mild weather it was possible to carry on riprap work, and considerable of this was done during the month. Other work consisted of making minor repairs to small structures, cleaning out trap boxes on some of

the closed drains and preparing an estimate of the yardage involved in the proposed Frannie Canal cleaning. Office work consisted of compiling data for the 1920 operation and maintenance report and project history.

Crops.—Marketing of crops continued slowly. The principal shipments consisted of 84 cars of alfalfa hay, 38 of alfalfa meal, 9 of wheat, and 4 of potatoes; 7 cars of cattle and 18 of sheep were also shipped. A slight improvement in the wheat and alfalfa markets was noted over the conditions prevailing at the close of last month.

Labor.—The labor situation was satisfactory.

Drainage.—No construction was in progress. The permanent operating organization was engaged in the repair of various machines.

Field and office engineering.—Field work was carried on by two crews, each on the Garland and Frannie Divisions and one crew from Shoshone Dam. One crew on the Frannie Division was engaged on work connected with construction and one crew on land classification and right of way in the third unit. The two crews on the Garland Division were engaged on topographic surveys for drainage, the Willwood Canal location, and on the location of the power transmission line. The crew at Shoshone Dam was engaged on surveys in connection with the power-plant location and construction and on the transmission line location in the Shoshone Canyon. Office work consisted of the preparation of farm-unit plats for the third unit of the Frannie Division, preparation of drawings in connection with the power-plant location at Shoshone Dam, and the location of the transmission line, making tracings of topographic surveys and the study of the drainage of the closed contours on the Cody Branch of the Chicago, Burlington & Quincy Railroad in the Frannie Division.

Construction.—Owing to the favorable weather, construction work continued on the third unit of the Frannie Division and on the power plant at Shoshone Dam. On the Frannie Division the timber work of the Frannie Canal flume across Sage Creek was about 85 per cent completed. Thirty-six minor timber structures were also erected on the lateral system of the third unit. The various earthwork contractors on the lateral system had about completed their work, moving 3,800 cubic yards of material during the month.

At Shoshone Dam the erection of the construction plant was continued. The construction power plant is completed and the cableway, derrick, and crusher plant were under construction. Excavation was begun on the power house and about 2,700 cubic yards were excavated. The trash racks at the head of the 42-inch blow-off pipes through the base of the dam were both pulled by the use of the cableway.—*J. S. Longwell.*

INDIAN PROJECTS, MONTANA.

BLACKFEET PROJECT.

Mild, pleasant weather predominated during January, with only occasional high winds and one snow-storm.

No field work was attempted during the month, all field crews having been disbanded during December when the camps were closed down for the season. What work was done was confined to the project office, where, in addition to the usual routine, considerable was accomplished on the annual feature history and operation and maintenance report.

On January 25, Project Manager R. M. Snell was summoned to Washington for a conference in con-

section with appropriations for the Blackfeet project, and in his absence Assistant Engineer H. L. Scott was in charge of the project.—*H. L. Scott.*

FLATHEAD PROJECT.

At Dry Fork Dam earth fill was completed January 1; with a total of 83,500 cubic yards. Gravel hauling was resumed and carried to completion. The amount of gravel blanket placed was 712 cubic yards, and 1,336 cubic yards of riprap were placed. The dam with appurtenant structures is 92 per cent complete.

At Pablo Feed Canal excavation progressed from station 1286+00 to 1326+00, a distance of 4,000 feet. Enlargement was completed when station 1325+19 was reached, the remaining 81 feet being excavation of entire section. The amount of material moved amounted to 12,472 cubic yards, of which 7,872 were class 1; 4,500, class 2; and 100, class 3.

At Dry Creek lining, clearing, and grubbing were in progress from station 190+00 to 145+00, a distance of 6,200 feet. Excavation amounted to 5,698 cubic yards, of which 3,038 were class 1; 2,000, class 2; and 660, class 3. This work was done between stations 204+00 and 165+00.

All construction was by Government forces.

Prospects for a good crop of winter wheat were doubtful because of the absence of snow during the latter part of December and early January.

Weather conditions were favorable for live stock.—*N. B. Hunt.*

FORT PECK PROJECT.

The weather for January was very good with the average temperature about 13° above normal. There was 0.06 of an inch of precipitation with a maximum of 3 inches of snow on the ground at any one time.

One car of cement was hauled from the warehouse at Poplar to the Poplar River camp. The P & H dragline arrived on January 8 and was unloaded and moved to the camp 7 miles north of Poplar.

Owing to the mild winter, the range is not covered with snow and it has not been necessary to feed any hay so far this winter. There is an abundance of hay available and a reduced rate has been obtained from the railroads so the surplus of hay can be shipped to other States.—*R. M. Conner.*

GENERAL OFFICES.

Washington office.—Director Davis was in New York on January 3 and in Boston on January 26 on personal business. During the week of January 16 he was in New York in connection with the annual meeting of the American Society of Civil Engineers, of which he is past president. He also conferred on the question of the power contract at American Falls with the Idaho Power Co.

During the absence of the director the office was in charge of Assistant Director Morris Bien as acting director.

The chief counsel was in the office the entire month.

On January 5 a hearing was held before Secretary Payne regarding the release of stored water from Pathfinder Reservoir for use of the city of Casper and the oil interests.

The sundry civil bill passed the House of Representatives on January 7, was referred to the Senate Committee on Appropriations, and reported to the Senate on February 4, the committee striking out the provision intended to authorize the reconveyance of land no longer needed to the donor or vendor. The Senate, in committee of the whole, adopted a provision for the continued publication of Govern-

ment publications (which includes the RECLAMATION RECORD) until December 1, 1921.

On January 18 a letter was sent to the Secretary recommending that the Reclamation Service be authorized to execute a contract with the Truckee-Carson irrigation district providing for the construction by the Service of a system of drains within the district at a cost not exceeding \$700,000, the district to repay the cost of the work in semiannual instalments over a period of 20 years; approved January 21.

On January 25 a letter was sent to the Secretary recommending the execution of a contract with the Imperial irrigation district, of El Centro, Calif., to furnish an additional sum of \$30,000 to continue the investigation of the feasibility of the All-American Canal to irrigate land in Imperial Valley, Calif.; approved January 27.

On January 27 a letter was sent to the Secretary, recommending that authority be granted to enter into a contract with the Yakima-Benton irrigation district to furnish the district 285,000 acre-feet of stored water and natural flow of Yakima River under the provisions of the Warren Act, at an estimated cost of \$6.50 per acre-foot; approved January 28.

On January 28 a letter was sent to the Secretary recommending approval, as to form, of draft of contract with the proposed irrigation district in Shasta Valley, Calif., providing that the district advance funds for an investigation to determine the feasibility of the project, and that the Service be authorized to enter into a contract with the district if the district is formed; approved January 29.

Secretary Payne set February 5 as the date for a hearing on the petition of the Farmers' Irrigation District, adjoining the North Platte project, requesting the execution by the Secretary of a written declaration to the effect that the readjustment of the district's bonded debt, as outlined in court decree of September 8, 1920, is a satisfactory compliance with paragraph 8 of the contract of December 12, 1917, between the United States and the district.

Secretary Payne set February 9 as the date for a hearing on the proposed power development by the Nevada Valleys Power Co. on Truckee River below the intake of the feed canal leading to Spanish Springs Reservoir.

During the month 1,485 inquiries from ex-service men concerning opportunities on the land were received and answered. Up to the end of the month a total of 180,296 such inquiries had been received.

Among the visitors during the month were Charles E. MacLean, Emmett Irrigation District, Idaho; Stanislav Spacek, an engineer connected with the Czechoslovak Legation, interested in rock-fill dams; J. A. Almira, New York, interested in the Powder River project, Oregon; Hudson Maxim; Mark Rose, of Imperial Valley, Calif.; L. L. Raymond, attorney for the Farmers' Irrigation District, Nebraska; and T. W. Monell, of the Uncompahgre project. Project Manager R. M. Snell arrived at the office on February 1, his presence having been requested by the Indian Office in connection with the Indian appropriation bill.

The accompanying statement of fund transactions shows a slight increase in the estimated Treasury balance over last month, amounting to about \$175,000. The receipts were about \$150,000 less than last month and the advances to fiscal agents were nearly \$200,000 greater. It is expected that the fund will receive about \$350,000 additional oil money in February. This, however, includes the item of \$200,000 mentioned last month. It is practically impossible to secure advance information as to the

status of oil funds from which to prepare a statement of anticipated revenues as a basis for an increased construction program. The December land sales amounting to some \$140,000 have already been made available and the \$600,000 received on account of oil funds was placed to our credit in the Treasury much sooner than would a like amount of collections by fiscal agents, so there was a little over a million dollars to the credit of the reclamation fund in the Treasury at the end of the month.

Fund transactions, U. S. Reclamation Service.

[Taken from Washington Office books for the month of January, 1921.]

Treasury balance from December report.....	\$979,326.02
From:	
Sale of public lands.....	273,316.78
Past production oil leases (net).....	610,362.11
Deposits by fiscal agents.....	102,275.65
Collected by auditor.....	2,526.93
Increased compensation advanced.....	47,300.00
Total credits.....	2,015,107.49
Withdrawals:	
Requisitions for advances, reclamation fund.....	763,500.00
Requisitions for advances, increased compensation.....	47,300.00
Auditor's settlements.....	47,317.23
Total withdrawals.....	858,117.23
Balance.....	1,156,990.26
Net land sales for December available in February.....	142,525.60
Estimated land sales for January available in February.....	150,000.00
Estimated proceeds oil leases available in February.....	14,464.83
Balance of funds with fiscal agents....	676,229.57

Schedule of Treasury balances, Feb. 10, 1921.

Estimated fund resources.....	\$2,500,000.00
Yuma auxiliary fund.....	293,785.03
Riverton, Indian, 1919.....	2,277.82
Riverton, Indian, 1920.....	97.60
Flathead, Indian.....	9,509.61
Fort Peck, Indian, 1919.....	36,793.95
Fort Peck, Indian, 1920.....	2,135.80
Fort Peck, Indian, 1921.....	6,622.88
Blackfeet, Indian, 1919.....	6,962.38
Blackfeet, Indian, 1920.....	1,830.61
Blackfeet, Indian, 1921.....	9,006.16

Denver office.—The chief engineer was out of the office from January 17 to 30, inclusive, visiting American Falls, Boise and Newlands projects, and attending the League of the Southwest at Salt Lake City. Assistant Chief Engineer R. F. Walter returned to the Denver office on the 9th after visiting the Strawberry Valley and Newlands projects. Assistant Chief Engineer C. P. Williams was engaged from the 12th to the 19th, inclusive, on board matters on the North Platte project. Official visitors during the month included J. L. Longwell, John G. Heinz, J. R. Alexander, W. W. Ungles, H. N. Bickel, and Laura Drinkwater.

In the designing division studies were made of the designs for the Willow Creek lateral system on the Belle Fourche project. A preliminary design and estimate for diversion and pumping plant at Black Rock Canyon, Boise project, was prepared. The drawings for the Lower Lost River Diversion Dam, Klamath project, were revised. Preliminary estimates and designs for the Guernsey Reservoir, North Platte project, and for the McLaughlin Rapids Dam, Okanogan project, were completed. Preliminary studies were made for the McKay Creek Dam, Umatilla project. Estimates were made for diversion dam and for the Three Forks Reservoir, Castle Peak secondary project. Preliminary designs and estimates were prepared

for diversion dam at the La Lomita site, Lower Rio Grande secondary project. Preliminary designs and estimates for the Alma and San Carlos Reservoirs, San Carlos secondary project, and for the Dewey Reservoir, Colorado River storage, were completed. Numerous designs were prepared for the various projects, covering culverts, wasteways, checks, flumes, bridges, and lateral siphons. Work was continued on the standardization drawings for reinforcing steel, metal forms, turnout gates, radial canal gates, cast-iron gates, and hoists.

The principal work accomplished in the electrical division consisted of studies relative to the development of water power at McLaughlin Canyon in connection with the pumping plant at Shellrock and near Riverside, Okanogan project; of studies relative to the interconnections at Milner with the Boise River plant of the Idaho Power Co., Minidoka project; of the preparation of estimates for the Black Canyon pumping plant, Boise project; of the preparation of working drawings for the Elephant Butte valves, Rio Grande project; of studies of penstocks, tunnel lining, and installation of valves on the outlet pipes. Shoshone Dam, Shoshone project; of preparation of miscellaneous drawings for the B Lift pumping plant, Yuma Auxiliary project; and of the preparation of preliminary estimates for three electrical pumping plants, Imperial Valley secondary project.

In the legal division consideration was given to the rewriting of the irrigation district bill as proposed by the Finance Commission of the State of Colorado. Consideration was given to the operation and maintenance estimates for the calendar year 1921 on 11 projects and to the various irrigation district matters on the Milk River, Lower Yellowstone, Shoshone, Riverton, Yakima, Umatilla, and Klamath projects.

An average of 508 pieces of mail per day was received during the month. Twelve hundred and twenty disbursement vouchers were paid, amounting to \$322,402.64. Advertisements to the number of 385 were issued by the purchasing division, and 583 vouchers were prepared involving a net expenditure of \$195,419.41. Transfers amounting to \$12,932.47 were effected between the various projects.—*R. F. Walter.*

CHINESE ENGINEER TO VISIT OUR WORKS.

Director Davis has been notified, through the Morgan Engineering Co., of Dayton, Ohio, that the Kiangsu Canal improvement board expects to send to America in the near future Mr. P. L. Shen, who will travel about eight months in the United States, looking over hydraulic engineering works, including the works of the Reclamation Service.

The Kiangsu Grand Canal improvement board is under the direction of His Excellency Chang Chien, who was instrumental in bringing to China the American Red Cross board of engineers, of which Director Davis was a member.

Every facility will be extended to Mr. Shen to aid him in examining the works of the Reclamation Service.

I always enjoy reading the RECORD very much.—*Geo. W. Duncan, Bard, Calif.*

ADMINISTRATIVE ORGANIZATION.

DEPARTMENT OF THE INTERIOR.

Hon. JOHN BARTON PAYNE, Secretary of the Interior.
ALEXANDER T. VOGELSONG, First Assistant Secretary.
SELDEN G. HOPKINS, Assistant Secretary.
CHARLES D. MAHAFFIE, Solicitor for the Interior Department.
CHARLES W. NESTLER, Assistant to the Secretary.
JOHN HARVEY, Chief Clerk and Superintendent of Buildings.

U. S. RECLAMATION SERVICE.

WASHINGTON, D. C.

Arthur Powell Davis, director; Morris Bien, assistant director; Ottamar Hamele, chief counsel; J. B. Beadle, director's assistant; C. J. Blanchard, statistician; Hugh A. Brown, editor; C. A. Bissell, engineer; A. H. Gullickson, chief accountant; Miss H. A. Fellows and Raymond Depue, fiscal agents; C. H. Fitch, chief clerk; Emmet Carr, purchasing agent; G. W. Numbers, appointment clerk; H. N. Bickel, Yakima, Wash., W. A. Meyer, Denver, Colo., and W. F. Kubach, Great Falls, Mont., examiners of accounts.

DENVER, COLO.

F. E. Weymouth, chief engineer, Tramway Building, Denver, Colo.; R. F. Walter and C. P. Williams, assistant chief engineers; Miss L. H. Meisel, secretary to the chief engineer; J. M. Gaylord, electrical engineer; J. L. Savage, designing engineer; James Munn, consulting engineer; J. L. Burkholder, drainage engineer; J. M. Luney, chief clerk; A. McD. Brooks, purchasing agent; Harry Caden, special fiscal agent.

FIELD LEGAL OFFICES.

Boise, Idaho.—B. E. Stoutemyer, district counsel. Projects: Boise, Minidoka, King Hill, and Jackson Lake Enlargement; R. M. Patrick, district counsel located at American Falls, Idaho.

Denver, Colo.—Law section office of chief engineer: E. E. Roddis and Armand Offutt, district counsel; J. J. Buck, assistant district counsel.

El Paso, Tex.—P. W. Dent, district counsel. Projects: Rio Grande, Carlsbad, and Hondo.

Helena, Mont.—W. J. Egleston, district counsel, Helena, Mont. Projects: Blackfoot, Flathead, Fort Peck, Huntley, Milk River, St. Mary Storage, Sun River, North Dakota Pumping, Lower Yellowstone, and Shoshone.

Mitchell, Nebr.—J. N. Beardslee, district counsel. Projects: North Platte and Belle Fourche.

Montrose, Colo.—J. B. Alexander, district counsel. Projects: Grand Valley, Uncompahgre Valley, and Strawberry Valley.

Portland, Oreg.—H. L. Holgate and D. G. Tyree, district counsel. Projects: Yakima, Okanogan, Umatilla, and Klamath.

San Francisco, Calif.—Henry A. Cox and A. B. Fullerton, district counsel, 349 Pacific Building. Projects: Salt River, Yuma, Orland, and Newlands.

PROJECT ORGANIZATION.

Belle Fourche Project.—B. E. Hayden, project manager, Newell, S. Dak.; R. C. Walber, chief clerk; August Lewin, fiscal agent.

Boise Project.—J. B. Bond, project manager, Boise, Idaho; E. R. Mills, chief clerk; C. F. Weinkauff, fiscal agent.

Carlsbad Project.—L. E. Foster, project manager, Carlsbad, N. Mex.; V. L. Minter, chief clerk and fiscal agent.

Grand Valley Project.—S. O. Harper, project manager, Grand Junction, Colo.; A. W. Walker, engineer; G. H. Murphy, chief clerk; A. H. Hall, fiscal agent.

Huntley Project.—W. M. Green, project manager, Balfantine, Mont.; G. H. Bolt, chief clerk; Miss M. C. Simek, fiscal agent.

King Hill Project.—Walter Ward, project manager, King Hill, Idaho; T. W. Hause, chief clerk; L. D. Eakin, fiscal agent.

Klamath Project.—H. D. Newell, project manager, Klamath Falls, Oreg.; N. G. Wheeler, chief clerk; G. R. Barnhart, fiscal agent.

Lower Yellowstone Project.—L. H. Mitchell, project manager, Savage, Mont.; C. A. Denman, chief clerk; Miss Ruth Lundin, fiscal agent.

Milk River Project.—G. E. Stratton, project manager, Malta, Mont.; E. E. Chabot, chief clerk; G. S. Moore, fiscal agent.

Minidoka Project.—Barry Dibble, project manager, Burley, Idaho; Dana Templin, engineer; E. C. Diehl, chief clerk; Miss A. J. Larson, fiscal agent; F. A. Banks, engineer, American Falls, Idaho.

Newlands Project.—J. F. Richardson, project manager, Fallon, Nev.; G. B. Snow, chief clerk and fiscal agent.

North Dakota Pumping Project.—W. S. Arthur, project manager and chief clerk, Williston, N. Dak.; H. C. Melas, fiscal agent.

North Platte Project.—Andrew Weiss, project manager, Mitchell, Nebr.; H. W. Bashore, engineer, Fort Laramie Unit; Paul Rothli, irrigation manager; J. R. Ummel, chief clerk; Miss A. L. Perrine, fiscal agent.

Okanogan Project.—Calvin Casteel, project manager, Okanogan, Wash.; W. D. Funk, chief clerk and fiscal agent; H. J. Gault, engineer, Conconully, Wash.

Orland Project.—A. N. Burch, project manager, Orland, Calif.; E. T. Eriksen, engineer; C. H. Lillingston, chief clerk and fiscal agent.

Rio Grande Project.—L. M. Lawson, project manager, El Paso, Tex.; T. W. Parry, irrigation manager; C. A. Peavey, chief clerk; L. S. Kennicott, fiscal agent.

Riverton Project.—H. D. Comstock, project manager, Riverton, Wyo.; G. H. Baird, chief clerk; J. C. Thrallkill, fiscal agent.

St. Mary Storage Unit.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk; H. E. Bruce, fiscal agent.

Salt River Project.—Being operated by the Salt River Valley Water Users' Association; C. C. Cragin, general superintendent and chief engineer, Phoenix, Ariz.

Shoshone Project.—J. S. Longwell, project manager, Powell, Wyo.; J. R. Iakisch, engineer; C. M. Jump, superintendent of irrigation; W. F. Sha, chief clerk; L. H. Kline, fiscal agent.

Strawberry Valley Project.—W. L. Whittemore, acting project manager, Provo, Utah; J. E. Overlade, chief clerk and fiscal agent.

Sun River Project.—G. O. Sanford, project manager, Great Falls, Mont.; H. W. Johnson, chief clerk; Miss M. G. Valentine, fiscal agent; G. A. Benjamin, irrigation manager, Fairfield, Mont.

Umatilla Project.—H. M. Schilling, project manager, Hermiston, Oreg.; M. D. Scroggs, superintendent of irrigation; G. C. Patterson, chief clerk and fiscal agent.

Uncompahgre Project.—L. J. Foster, project manager, Montrose, Colo.; A. H. Peach, chief clerk and fiscal agent.

Yakima Project.—J. L. Lytel, project manager, Yakima, Wash.; C. E. Crownover and C. F. Gleason, engineers; R. K. Cunningham, chief clerk; J. C. Gawler, fiscal agent; J. G. Heinz, engineer, Sunnyside, Wash.; J. S. Moore, superintendent of irrigation, Naches, Wash.

Yuma Project.—P. J. Preston, project manager, Yuma, Ariz.; R. M. Priest, superintendent of construction; E. R. Scheppeleman, chief clerk; E. M. Phillebaum, fiscal agent.

INDIAN PROJECTS.

Blackfeet Project.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk and fiscal agent.

Flathead Project.—E. A. Moritz, project manager, St. Ignatius, Mont.; C. J. Moody, engineer; J. M. Swan, acting chief clerk; J. P. Siebenelcher, fiscal agent.

Fort Peck Project.—R. M. Conner, project manager, Poplar, Mont.; Henry Berryhill, chief clerk and fiscal agent.

WORK AND SAVE. BUY GOVERNMENT SECURITIES.



UNCOMPAHGRE PROJECT OFFICE AND EMPLOYEES.

Left to right. Top row: Leo E. Dunbar, Dean C. Allison, Ernest Johnston, A. H. Peach, J. R. Alexander, G. A. Brown, P. N. Dahl, Porter J. Preston, project manager, now project manager, Yuma project. Bottom row: H. E. Fair, John E. Deno, C. B. Elliott, E. Lee Sonnenberg, Miss Amelia Ziller, Miss Elisabeth von Ilagen.

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The Reclamation Record

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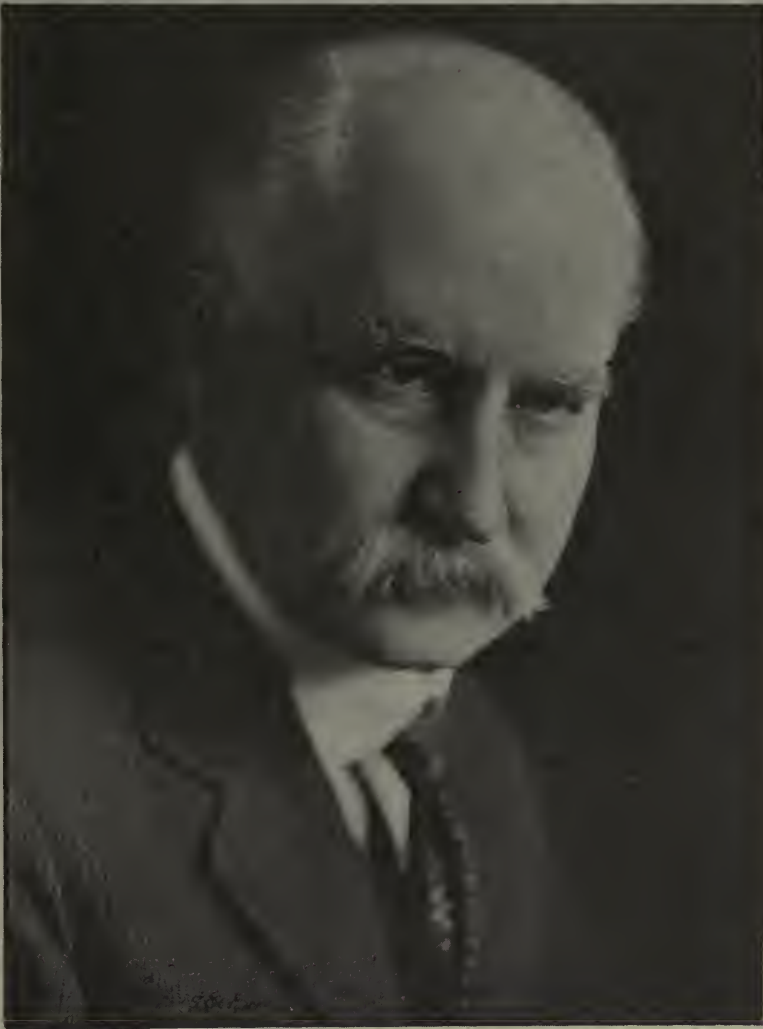
Better Farming : Better Business : Better Living

THERE CAN BE NO SUREER INSURANCE FOR THE NATION THAN TO PUT ITS MEN UPON THE SOIL

VOLUME 12, No. 4

PRICE ^{FREE TO OUR WATER USERS}
^{SEVENTY-FIVE CENTS A YEAR TO OTHERS}

APRIL, 1921

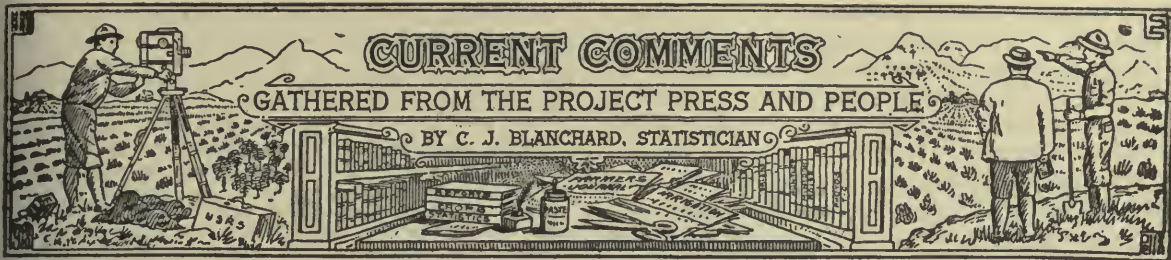


HON. ALBERT B. FALL, SECRETARY OF THE INTERIOR.

HON. ALBERT B. FALL, SECRETARY OF THE INTERIOR.

HON. Albert Bacon Fall, of New Mexico, is the new Secretary of the Interior in President Harding's Cabinet.

Secretary Fall is eminently a western man. Born in Frankfort, Ky., November 26, 1861, he early in life went to the Southwest and has been prominently connected with the development of the Territory and State of New Mexico. His education was obtained in country schools and in the practical school of experience and study; yet he taught school himself as a young man and prepared for the practice of law, which he began in 1889. His experience embraces a variety of typical western activities, including ranching, mining, lumbering, and railroads. In the Spanish War he was captain of a company in the First Volunteer Infantry of New Mexico. He served as a member of the New Mexico Legislature, as associate justice of its supreme court, twice as its attorney general, and as a member of its constitutional convention. Since 1912 he has represented New Mexico in the United States Senate.



OFFICIAL Washington is undergoing the changes in personnel which always accompany a change of administration. This is a period of unrest and uncertainty for all outside of the classified service. In the Department of the Interior the new members are few in number up to the present writing, but being men who are familiar with the broader activities of the department the work is proceeding without delay or friction. The appointment of Secretary Fall is regarded as a deserved concession to the long expressed demand of the West for a man thoroughly conversant with western needs and conditions. His experience of more than a quarter of a century in public land States, during which period he has been a homesteader, miner, cattleman, legislator, and United States Senator, peculiarly fit him for the position of Secretary of a department which has to do with the vast and complex problems of administering the undeveloped resources of our public domain. Having devoted many years of his life to hewing a ranch out of the desert, a ranch which he still operates as a home, the western homemakers may rest assured that their cause will have his sympathetic and intelligent consideration. The miner and stockman too have cause to rejoice that their claims before the department henceforth will be reviewed by one whose knowledge has been gained through personal experience in their own business. A new atmosphere pervades the department. It is the atmosphere of the optimistic West, and it is most stimulating. We predict a forward looking administration crowned by real achievement.

The clouds are breaking in the West, spring has come, and the farmer is in his fields again, bravely facing the future and hopeful that when another harvest time arrives his present financial troubles will be alleviated. Recognition of his problems and methods aimed to put farming as an industry on a more stable footing are promised by our lawmakers and other agencies which are in position to be helpful. Meanwhile there is to be no let up on the part of the farmer to produce the food upon which the world depends.

Reports from many projects indicate a great awakening in dairying, and we look for a large increase in the number of grade and registered milch cows. During the period of abnormally high prices for hay many farmers unwisely disposed of their dairy stock.

With hay selling to-day at less than prewar prices, the farmer now realizes his mistake and is trying to get back into dairying again. He finds this somewhat difficult just now owing to lack of funds and inability to borrow. On a few of our projects men of means are generously extending aid by purchasing and distributing cows to experienced dairymen and accepting part of the cream checks in payment. This method was successful on several projects before the war, and should prove equally so now, as our farmers have grown in experience in the business. One good has come out of the diminution of milch stock, and that is the elimination largely of the scrubs. Those who take up dairying henceforth will have only good cows, and returns may be expected to show up better in the bank accounts of the dairymen.

NOTED HERE AND THERE.

California, Orland project.—Orland's claims of an opportunity for the poultry business were in a large measure substantiated when Mr. W. B. Douglas, who owns some property east of Orland and who has about 300 White Leghorn pullets, reports that for the month of January the hens brought him \$202.

Mr. Douglas contemplates entering the poultry business on a larger scale.

The Jersey Cattle Club, of Orland, have taken very active interest in starting a pure-bred calf club in Glenn County. Rules have been drawn up and a place made in the coming fair awards for such a club to stimulate interest in the calf club.

The banks of northern California have loaned over \$12,000 to boys and girls in order to purchase pure-bred calves of quality. The prices paid for some of these animals were very high, running from \$175 to \$500.

Colorado, Grand Valley project.—J. W. Vannice recently closed a deal for the sale of the old Dan Freemeyer 8 acres, 2 miles west of Palisade, to Clifford Snyder, a Palisade man, for \$6,000. It was the property of W. A. Smith, of Topeka, Kans., who bought it through the same agency two years ago for \$4,000. Mr. Smith has harvested two crops from which he netted \$8,343, and this added to the \$2,000 which he receives more than he gave is a net income from that 8-acre orchard of \$10,343—not a bad deal, to be sure.

Colorado Uncompahgre project.—One of the Delta banks and the Delta Chamber of Commerce are mak-

ing a complete survey of the dairy-cow situation in that county. They will ascertain the exact number of dairy cows, the number of pure breds, grades, and scrubs. They will find the exact amount of butter fat produced in the entire county last year and just what was done with it.

A campaign will be inaugurated in that county to increase the dairy herds. The need for better sires and pure-bred bulls will be impressed upon the farmers. Calf clubs will be started for the boys and girls, and the raising of all pure-bred dairy stock will be encouraged.

Dairy cattle are the biggest paying proposition on the farm in a year like this one. The farmers have on hand much low-priced hay and ensilage, which when fed to pure-bred dairy stock will return good dividends.

"It was the best thing that ever happened to me when I couldn't sell my hay last fall," says J. C. Moberly, proprietor of a dairy at Riverside, "for it made me look about for a way to get rid of my hay, and it drove me into the dairy business.

"The Uncompahgre Valley will soon be a second Wisconsin in dairying if the farmers wake up and realize the possibilities," said he. "We produce the best feed in the world, have the sunshine and warm winters, require no expensive barns, and can produce dairy products more cheaply than Wisconsin. If dairying is practiced here as it should be, it will bring factories to Montrose, such as cheese and condensed-milk factories."

Mr. Moberly, who has been ranching in the valley for six years, has recently gone extensively into the dairy business, and is now milking 18 high-grade Holsteins. He has within the past week installed a De Laval milking machine of two units, with which he can milk the cows in 50 minutes, a process heretofore tedious and requiring three men almost that long.

Here are some interesting and valuable suggestions regarding the dairy interests, furnished for our Uncompahgre farmers by Mr. H. A. Ireland. They are worthy of careful consideration by farmers on other projects:

It was estimated that nearly 83,000 tons of alfalfa was produced on the Uncompahgre project in 1920, having an assumed value of something over \$820,000. What the actual value of this hay is would be hard to guess, for the greater part of it is still unsold and there is very little demand for it.

This amount of hay, if fed exclusively to dairy cows, would full feed about 13,800 cows, and if the cows were just reasonably good they ought to produce from that much hay something over 4,000,000 pounds of butter fat, which should make the hay bring from \$15 to \$25 per ton, depending upon the price of butter fat, and leave the skim milk, calves, and manure to pay for milking the cows. Of course, no one would suggest feeding all of this hay to cows. Other stock must have their share; but there is "food for thought" in the above supposition.

Now, suppose there were an average of only four reasonably good producing cows on each of the 1,588 farms on the project. They ought to produce a minimum of nearly 2,000,000 pounds, or over 1,200 pounds per farm, which should be worth around \$500.

The idea is this: Most families milk one or two cows for home use, and the extra work of milking and caring for two or three more would be slight. The butter fat produced over what is needed for the family would go a long way toward paying the running expense of the household in cash, so that there would be no grocery bills, accumulating throughout the year to be met when the potatoes, beets, or apples are sold.

In Delta County they are talking about a dairy extension program. The men who are promoting the idea are dairy enthusiasts, but they don't seem to be "cranks." They do not expect to make Delta County an exclusive dairy county; rather, they have in mind these points: A cow on each farm; a few more cows on most farms; better cows on all farms; more profit from all cows; and pure-bred bulls to replace the grades now in service. The program looks right and should be extended to include Montrose County as well as Delta.

The man who owns a few good cows and takes proper care of them seldom has any trouble getting what credit he needs, because he becomes known as a man who pays as he goes. On the other hand, because he pays as he goes, he is less likely to need credit. There may be plenty of reasons why there are not more dairy cows in this valley, but among those reasons the one that a good cow will not more than pay her way does not appear. But none wants to keep a cow for the sake of her society or the fertilizer she produces. She should be required to return a profit over the cost of her feed.

Idaho, Boise project.—Articles of incorporation for the Caldwell Growers' Products Co., with a capital stock of \$60,000 have been filed at Caldwell. According to the articles, the principal place of business is to be at Caldwell.

The corporation was formed to plant all kinds of fruit, vegetables, nuts, and produce, and to buy and sell these kinds of produce; to manipulate and deal in fruits, vegetables, hay, grain, flour, and feed; to dry and can fruits and vegetables; to provide cold or other storage rooms; to purchase and cultivate farm lands; to deal in and manufacture sprays and spray materials and other horticultural supplies.

There are 4,000 shares of stock with a par value of \$5 a share and 400 shares of preferred stock with a par value of \$100.

Idaho, Minidoka project.—The cheese factory is doing fine, receiving over 3,000 pounds of milk daily and making cheese every day. For a while after opening up this fall they were forced to make cheese only every other day, as they did not have enough milk, but this condition lasted only until enough milk was received to allow them to make cheese daily. A large shipment valued at over \$1,000 was shipped recently to the Hansen Packing Co., Butte, Mont. The factory is doing well and will do better when more farmers support it.

That a cross-testing association and organizations that have a tendency to make for good stock are a

necessity to this district before great strides can be made in the dairying business, and that this industry will mean more to the community than any other, is the opinion of Ed LaRue, well-known farmer and owner of some pure-bred cows and horses.

Mr. LaRue has both pure-bred Holsteins and Short-horns. Of the former he has two cows that are big milk producers. One, 10 years old, gives 11 gallons of milk daily, and the other 9 gallons. He feeds nothing but alfalfa, and he figures each eats about a ton a month. He delivers the milk of these cows to the cheese factory, and says the two will average \$30 per month. Subtracting \$7 per ton for the alfalfa fed, he realizes an income of \$23 per head per month.

"The trouble with many of us on the project," he declares, "is that when hay is selling for \$15 or \$20 a ton we sell our cows, and then when the market lowers on alfalfa we want to go into the dairy business.

"This is an ideal country for dairying, and the farmers should get good stuff and improve it, and hold to it. They will find that the good cow will prove the best market for their alfalfa."

Montana Milk River project.—In order to prove the assertion that Milk River valley bluejoint hay has the highest feeding value of any hay that is grown, figures have been secured from the experiment station at Bozeman to substantiate the statement.

Tests carried on at the experiment station show that 100 pounds of bluejoint hay contains 56.7 pounds of digestible nutriment. The composition of some of the other feeds is as follows: Timothy hay 48.5, red top 53.2, bluegrass 51.6, alfalfa 51.6, red clover 50.9.

Nevada, Newlands project.—The Newlands Project Cantaloupe Association board met recently and discussed matters vital to this growing project industry.

Markets are to be found as soon as possible. A wrapper design is being prepared to advertise the melon products here, including "Hearts of Gold" and "Lahontan Project" varieties. A packing shed is to be provided and the crating materials, labels, wrappers, etc., are all being worked out.

A pamphlet is to be gotten out so that the growers may benefit from the experiences of the men who have pioneered in melon production in this valley so far back as 15 years ago.

One hundred acres is the objective set by the association as the maximum and minimum acreage that will be planted this year. This means, it is asserted, that three carloads of melons will leave here daily for outside markets throughout the entire melon season. The standard of melons is to be maintained at the highest point and only best quality and uniform sized melons will be shipped.

It is doubtful if any single forward movement in this valley has ever carried the portent for good that

attaches to the cantaloupe project of the present moment. Many thousands of acres of the lands of this valley are especially adapted to the production of all varieties of cantaloupes and best judges who have passed upon them asseverate that the local production is without an equal in any country.

North Dakota, Williston project.—The Williston Irrigation District calls attention to opportunities on the irrigable lands of the district for farmers with experience in irrigation. There are no public lands available for entry, but attractive terms in small cash payments or even crop payments can be secured on tracts of from 5 to 160 acres, some improved and some unbroken land without improvements.

Oregon, Umatilla project.—April 8 has been designated as clean-up day on the Umatilla project, and the city and country folks are going to make it a real one. All business houses will operate with only one person in charge, and the lawyers, doctors, merchants, and others are pledged to go forth and labor on the streets and highways as well as about their own homes. They want to sound the death knell to the weeds.

South Dakota, Belle Fourche project.—The Dakota Creamery Co., of Deadwood, S. Dak., has established a cream-buying station at Newell. This company is owned by business men of Deadwood and will furnish a good market locally.

Cream sold to the Dakota Creamery station at Newell will be helping to make this section one of the good dairy sections in the State.

New Mexico-Texas, Rio Grande project.—A most ambitious program of civic improvement is under way in El Paso County. The county officers, with the co-operation of all the organizations in the valley, are making a big effort to gridiron the county with fine highways, and an expenditure of \$1,125,000 will be made in 1921. Several years ago plans were developed and the work begun to construct concrete highways running north and south through the heart of the settled part of the valley. This main trunk since completion has demonstrated its value so emphatically that feeders to it are now proposed which when completed will give the county a highway system second to none in this country. A monument to the civic pride of her citizens is the new scenic drive of El Paso. This magnificent road over Mount Franklin furnishes an impressive view of the city and many miles of the valley below it. From the heights a wonderful panorama is unfolded, including Fort Bliss, Juarez, and the mountains of old Mexico. The highway cost \$100,000, and will eventually link the city with a number of recreation parks which are to be built in the mountains.

The Farm Bureau News, in a recent issue, says:

A careful summing of the facts presented during the recent meeting of the El Paso and Dona Ana County farm bureaus will prove that we are living

in a most favored locality. No one can deny that we have an abundance of pure, wholesome air; all the sun that God can provide; a most fertile alluvial soil; and more water than has any other project in the United States. If we have not been prosperous, let's not be unfair and blame the country with our misfortune. Could it be that we have not kept the proper tab on our farming operations; has our live stock been of a poor class; or have we failed to market satisfactorily? Could it be possible that we need more cooperation? Whatever the failure, we must admit that the country is not at fault and the remedy is within ourselves.

With subscription pledges amounting to \$10,000 a year apparently secured, the Las Cruces Chamber of Commerce is planning a great campaign for Mesilla Valley. Wisely, the promoters of the organization have sought members from all classes of citizens so that the new chamber of commerce will be representative of all interests.

Washington, Yakima project.—Three of the 14 cows which, according to records, have produced more than 30,000 pounds of milk in a single year, have been.

Yakima Valley products, according to Alec Todd, of Todd & Sons. They are Cascade Johanna Illustrites and Cascade Fleta Johanna, both bred by Todd & Sons, and Ormsby Segis Marie, formerly owned by the late Elmer B. Marks, but now in California. Todd also owns Cascade Blossom, which recently completed a test that places her as world's champion 10-months producer. He also has a junior 2-year-old, Cascade Pieterje, who produced 21,848 pounds of milk and 910 pounds of butter in a year.

At an average price of \$365 a head for cows and heifers and \$152 for bulls, 21 head of Guernsey cattle, bred by H. E. Angel, of Mabton, were sold at auction for \$6,600. All purchasers announced their intention of keeping the stock in the Yakima Valley. The highest price paid at the auction was for Olga Dunn, 3-year-old heifer, bought for \$795 by Charles Palmer, of Donald; the next highest, \$700 for Middledale Grace Darling, first-prize animal in the 3-year class at Pacific International Exposition, was paid F. H. Rote, of Wapato. —C. J. B.

THE NET DUTY OF WATER.

By Prof. W. L. Powers, Chief in Soils, Oregon Experiment Station, Corvallis, Oreg.

B*Y net duty* is meant the quantity of water required to be delivered to the field or the forty.

Water requirement is a term used to refer to the total soil, rainfall, and irrigation water required per unit of crop, and is conveniently expressed in "pounds of water per pound of dry matter" in crops produced.

Irrigation requirement refers to the irrigation applied artificially to meet the water requirement of the crop.

As to standards for judging the terms we may consider, first, the yield per acre which is best in a new country; second, the yield per acre-inch or per acre-foot which is a valuable standard for judging results where water is high in cost, as where pumped, and which is best for showing the efficiency per unit of water; third, the maximum net profit per acre which is regarded as the best present basis for determining the economic duty of water. Maximum net profit per acre is realized with more water than is required to give the maximum yield per acre-inch, but with a little less water than is required to give the maximum yield per acre. Where costs are high the maximum net profit draws closer to the quantity required to produce the maximum yield per acre-inch, so it allows for beneficial use according to conditions, all costs considered; further, it makes possible the highest productive values.

Modern irrigation contemplates that the water be measured. This lessens contention, dispels doubt, and increases duty. The amount of water at present

used does not necessarily indicate the amount needed, yet it shows what farmers are getting along with in practice, and the difference between the amount used and the indicated net duty shows the amount of possible improvement. The use on about 1,000,000 acres included in the United States reclamation projects reported by Moritz in the RECLAMATION RECORD¹ shows that the amount used during the past six years has been materially decreasing.

Average depth applied in 1918 on 22 Government projects was.....feet--	2.75
Range.....do.....	0.68-6.30
Average rainfall.....do.....	0.82
Total water received.....do.....	3.57
Average per cent of alfalfa and other meadows for these projects was.....	52.5
Average per cent of alfalfa and other grain.....	22
Average per cent of alfalfa and other cultivated and miscellaneous crops.....	25.5

Alfalfa and meadows occupy 50 per cent of the irrigated area and require, roughly, about twice the amount of water as other crops, such as grain and row crops need, hence, merit 75 per cent of our attention, as they require 75 per cent of the irrigation water.

Water variation experiments on alfalfa afford data for each of eight States. The indicated economic duty or amount giving the indicated maximum net profit runs from 30 to 40 inches, where yields are from 4

¹ Reclamation Record, March, 1920, page 128.

to 9 tons, or 0.12 to 0.20 ton per acre-inch. Based on 12 years' water requirement studies at Corvallis, Oreg., and on the average water requirement which in each year gave the maximum net profit, it takes 5.23 inches under field conditions per ton of alfalfa produced, or 0.166 ton per acre-inch. On this basis it would take 15 to 18 inches depth of irrigation for a 3-ton region, or 30 to 36 inches for 6-ton land.

Grain crops require less water. In the water variation trials on wheat carried on for six States the irrigation requirements ran from 13 to 24 inches in depth, the yield amounting to 15 to 55 bushels and under good conditions up to 3 bushels per acre-inch. In other words, fairly efficient use of the water is being secured where 3 tons of alfalfa are secured with 15 to 18 inches, or 36 bushels of wheat with 12 inches, or 300 bushels of potatoes with 12 inches depth of irrigation.

FACTORS AFFECTING FARM OR FIELD DUTY.

1. The kind of ditches or distributaries affects the loss in delivery on the 40. They should be large enough to permit rotation in use and of compact section; 10 to 15 per cent of waste below the turnout is allowable under present conditions.

2. Careful preparation of the land by thorough leveling to one or more planes will save time, money, and water.

3. The method of applying water affects the irrigation requirement. The head and length of run should be such that the plot irrigated can be covered by the time the irrigation has wet the root zone. In many of our valleys the flooding system is being improved by the introduction or extension of the strip-border method of flooding and by determining the proper length and width of strips.

4. Climate affects the duty of water. Evaporation records are as important as rainfall, as they give a collective measure of the drying influences of the weather.

5. Altitude as related to climate affects the duty. If the loam soil in eastern Oregon requires about 3 feet up to a 2,000-foot elevation, 2 feet is a reasonable depth of irrigation at a 3,000-foot elevation and 1½ feet is suitable for a 4,000-foot elevation.

6. Soils, their texture, depth, structure, or, collectively, their usable water capacity affect duty. Our coarsest irrigated sand has a usable water capacity of about ⅓ of an acre-inch per acre-foot; for fine sand, 1 inch per acre-foot; fine sandy loam 1½ to 1¾ inches; very fine sandy loam 1½ to 2 inches; silt loam 1¾ inches; silty clay loam approximately 2 inches per acre-foot. Some of our peaty loam soils have usable water capacity of 2 to 3 inches per acre-foot as determined by the cylinder method under field conditions.

7. Duty is affected by the kind and variety of crops. Meadows require much water, grain crops and peas require a moderate amount, and cultivated crops, such as potatoes, require still less.

8. The average yield up to a certain limit represents to some extent a ratio between the quantity of crops and the quantity of water required. The average yields under good modern methods of farming should be considered in determining duty.

9. The kind and amount of cultivation affect greatly the irrigation requirements.

10. The method of delivery affects the use of water and this conforms as nearly as possible to plant needs. A higher duty may be obtained where the irrigator pays at least maintenance charge in proportion to the actual amount of water used.

11. The skill and economy of the irrigator are important factors. During irrigation the irrigation farmer is worth more in manipulating his irrigation and watching it than he is on any other work ordinarily done on the farm.

12. The time of irrigation affects greatly the efficiency of the water applied. The whole purpose of irrigation is to provide a favorable moisture content. In the Oregon experiments the moisture was applied according to the moisture content of the soil. It was found that as much as 50 more bushels of potatoes could be secured by applying water at just the right time.

13. The amount of water applied at each irrigation affects the use of water. It should be sufficient to raise the moisture content to the excess point throughout the root zone.

14. Soil fertility is one of the most important factors affecting irrigation requirement. With good fertility the plant does not have to exert as much effort to secure the nourishment required to form a pound of dry matter. For example, with potash as fertilizer we have obtained 39 bushels of potatoes per acre-inch, whereas an unfertilized adjoining acre returned only 24 bushels per acre-inch. Applications of sulphur have increased the efficiency of water per acre-inch about 25 per cent on several Oregon irrigation projects. About 16,000 acres of alfalfa have been sulphured in the State. Experiments have proved that applications of 80 to 100 pounds of sulphur per acre once in four years will increase the yield at least a ton per acre per year on 200,000 acres of alfalfa land under irrigation in the more arid sections of the State.

15. Crop diversity is important. A cultivated cash crop which requires little water generally gives large cash returns per unit of water consumed. Such a plan also involves distribution in the use of water on irrigated lands.

16. Crop rotation is of more importance to the irrigation farmer than to the rainfall farmer. As large irrigated crops generally remove large amounts of

fertility, equally large amounts of refuse should be returned to the land. Rotation permits plowing up of the meadows and marketing the nitrogen accumulated by the legumes; and plowing increases the usable water capacity and liberates plant food.

The value of crop rotation and manure has been tested by the Oregon station. In a recent experiment covering two 3-year rotation cycles beans were grown continuously in comparison with beans in rotation with grain and alsike clover. The upper half of each half-acre plat was dry farmed and one side of the half-acre was manured. The three crops were represented in the experiment each year. Beans grown continuously for six years yielded under irrigation 10.21 bushels; with irrigation and rotation the beans grown on alsike clover sod yielded 15.49 bushels, and beans rotated and manured yielded 18.25 bushels. The yield per acre-inch was 4.8, 6.16, and 7.3 bushels, respectively. The average yearly net profit due to rotation under irrigation was \$11.72, which was increased with manure and rotation to \$21.50.

The net profit per acre-inch for beans grown continuously was \$6.84, grown in rotation \$11.52, and grown in rotation with manure plants \$15.44, showing the great value of rotation and manure in increasing the efficiency per unit of water employed. The water requirement per pound of dry matter with continuous cropped beans was approximately 2,500 pounds, in rotation 1,700 pounds, and with rotation and manure 1,300 pounds. Beans give a moderate amount of dry matter per acre, hence the water requirement of this crop is rather high.

Crop-producing power of water.

[Based on an average water cost of most profitable plot records under field conditions, showing least probable amount of water (acre-inches) likely to be needed for different yields.]

Alfalfa.		Clover.		Grass.		Beets.		Potatoes.	
Yield per acre.	Acre-inches required.	Yield per acre.	Acre-inches required.	Yield per acre.	Acre-inches required.	Yield per acre.	Acre-inches required.	Yield per acre.	Acre-inches required.
<i>Tons.</i>		<i>Tons.</i>		<i>Tons.</i>		<i>Tons.</i>		<i>Bush.</i>	
1 5.23		1 3.84		1 4.27		5 2.5		50	1.5
2 10.46		2 7.68		2 8.54		10 5.0		100	3.0
3 15.69		3 11.52		3 12.81		15 7.5		150	4.5
4 20.92		4 15.36		4 17.08		20 10.0		200	6.0
5 26.15		5 19.20		5 21.35		25 12.5		250	7.5
6 31.38		6 23.04		6 25.62		30 15.0		300	9.0
7 36.61		7 26.88		7 29.89		35 17.5		400	12.0

17. The water cost or water requirement per pound of dry matter is reduced by most farming operations that improve the tilth and soil fertility and by having a good, even stand of the best variety, seeded, cultivated, and irrigated at the right time. Similar factors affecting evaporation or percolation have a bearing on duty. However, water requirement is a tech-

nical measure of the efficiency secured for each unit of water. Based on the water requirement in the western Oregon experiments, it has taken 5.23 inches to produce a ton of alfalfa, 3 inches to produce 100 bushels of potatoes, and one-half inch to produce a ton of beets.

18. In arriving at a reasonable duty of water we must take into consideration the value of land, water, labor, and crops for the district. At present, in the Northwest at least, the maximum net profit per acre seems the best basis for judging economical use of water.

The problem of economic duty of water is very complex, but all the agricultural wealth, developed and undeveloped, in the arid West will be favorably affected by its determination. The cost of investigation is returned manyfold by securing gains from irrigation. We must plan with the future in mind, each decade being provided with a practical duty according to the times. It is believed that the great principle of beneficial use will permit us to make adjustments for each decade according to economic and other conditions to provide a practical, economical duty of water.

When we consider the potential fertility of the great sagebrush plains and view the great watersheds and snow-capped peaks, it appears that the Great Architect of the Universe placed these here as a plain commission to the people of the arid West to store, harness, and utilize the waters sent down in season by the summer sun to give value to the arid lands and to develop our soil and water resources so as to secure the highest efficiency and afford the greatest food production for the support of man.

PROJECT MANAGER MORITZ RESIGNS.

Ernest A. Moritz, former project manager on the Flathead project, Montana, has resigned from the service, effective at the close of March 31, 1921, to join a corporation in Illinois in general engineering and contracting work.

Mr. Moritz is a graduate of the University of Wisconsin with the degrees of B. S. and C. E. He was connected with the Reclamation Service more than 14 years. For several years he was employed on the Yakima project, and for about six months in the Helena, Mont., office. In October, 1912, he was assigned to the engineering section of the Washington office and remained in that section until July, 1915, when he was transferred to the Denver office as office engineer. He held that position until his transfer to the Flathead project as project manager on March 16, 1920.



Variety Means Success in Rat-Poisoning Campaigns.

RAT-POISONING campaigns often fail because the house owner does not give his intended victims a sufficient variety of edibles.

Rat baits may be divided into three classes—meat foods, vegetable foods, and cereals. In mixing his baits the successful poisoner selects a food from each of the three classes and combines it with barium carbonate in the proportion of one part poison to four of food. Then he places a teaspoonful of each variety on a strip of paper or bit of board, so that the rat, traveling along his runway, finds a three-course meal all laid for him. Usually one of the three baits appeals to him, and the rat population is reduced by one. Poisoned baits should be watched carefully and uneaten baits replaced by others of the same class on the following evening. In this way a wide selection of foods may be used without departing from the basic combination. All baits must be kept fresh and tempting if the process of extermination is carried to completion. The common practice of smearing a dab of poison on a bit of stale bread, which is then placed in some out-of-the-way corner and neglected, will not produce satisfactory results.

Barium carbonate is the poisoning agent recommended by the specialists. It is tasteless, odorless, and can be obtained at any drug store. Full directions for its use and a complete list of the food combinations suitable for a poisoning campaign can be obtained upon request to the United States Department of Agriculture, Washington, D. C.

Management of Fattening Lambs.¹

Buying feeders.—The ideal feeder lamb is a thrifty, smooth, blocky, black-faced lamb weighing about 60 pounds. In actual practice this ideal is not always obtainable, but it should be kept constantly in mind while selecting feeders. Individual lambs weighing less than 50 pounds are usually held over and marketed as yearlings. Individual lambs weighing 80

pounds or more should be ready for market without further feeding. Feeder lambs must also be thrifty and not stunted or wormy, and they should carry as much black-faced blood as possible. Late lambs and lambs from districts of rather scanty feed make good feeders, but an early lamb that has good feed all summer and is still only a feeder in the fall, very likely has something wrong with him. It should be remembered that whereas a standard-size double-deck car will accommodate 300 or more feeder lambs, it will not take care of them after they are fat. Two hundred and fifty in a car will be plenty after they are fat and ready for market; if exceptionally heavy and carrying a large amount of wool, 200 may be enough.

Equipment.—Feed yards should be located on dry, well-drained ground, and in most cases should be fenced dog tight. Possibly the most popular method of feeding hay is by an arrangement of panels set at right angles to each other. These panels are made of 1-by-6-inch boards with a 12-inch board on the bottom, and the second board 7 inches above. This leaves sufficient space through which the lambs can feed. The hay is then pushed up to the fence from the outside. Whatever system is used the feeding should be done from the outside; teams and wagons can not be driven into the feeder lots with safety to the lambs. The best grain trough is one about 12 inches wide, 4 inches deep, and placed 2 inches from the ground. It should also have a bar along the top to prevent the lambs from jumping into it. These troughs should be in a separate pen, into which the lambs are turned after the feed has been distributed. It is important to have about the right amount of trough room. If too much, the greedy lambs get a second helping; if not enough, the weak lambs will not get their share. About 12 inches of space on one side of the trough is required for each lamb.

Plenty of good clean water and salt must be provided, so that the lambs can have easy access to them at all times. In freezing weather tank heaters placed in the water troughs are of great assistance.

Feeding.—If proper feed-trough space has been provided, lambs can be started on one-fourth pound

¹From Oregon Agricultural College Experiment Station Bulletin 175, by Robert Withycombe and E. L. Potter.

of grain a day without the slightest danger. In two tests the lambs were started on oats, but this did not seem necessary, as the lot started on barley never gave the slightest trouble. Grinding grain is not necessary for fattening lambs, although for old ewes with broken mouths it is desirable to grind the grain, and also chop the hay. Feed troughs should in all cases be kept clean and the grain very evenly distributed in the troughs before the lambs are turned in. Fresh hay should be given three or four times a day and the refuse cleaned out once a day.

Length of the feeding period.—A good feeder lamb will be fat in 90 days and as large as the market will stand. Very light lambs might be kept on full feed 100 days, and extra-good feeders will be ready to market in 60 days.

Financial discussion.—The question of profit or loss is always most vital to the stockman or feeder. The feeding of lambs does not differ materially from that of other live stock and conditions are never twice the same.

The following information will be found helpful for calculating the cost of a finished lamb where a 60-pound feeder costs \$6, barley \$60 a ton, and alfalfa \$20 a ton, and the feeding period is to be 90 days. The amounts of feed required and the estimated gains are based upon experiments in feeding in the open lot. The insurance is also based on these tests, in which there was a loss of 1.6 per cent, including losses in transit:

Method of figuring feeding costs.

Cost of 60-pound feeder lamb, at \$10 per 100 pounds—	\$6.00
Interest on above, at 8 per cent for 90 days—	.12
Insurance, at 1.6 per cent—	.10
292 pounds of alfalfa, at \$20 a ton—	2.92
75 pounds of barley, at \$60 a ton—	2.25
Labor, at \$6 a day per 1,000 lambs—	.05
Final cost per head—	11.44
Gain per head—26 pounds.	
Final weight per head—86 pounds.	
Final cost per 100 pounds—	\$13.30.

This means that a lamb costing \$10 a hundredweight must, at the feed prices quoted, sell for \$13.30 a hundredweight after 90 days' feed in order to pay for feed, interest, insurance, and labor. These are farm prices; if the lambs are bought or sold at more distant points allowance for shipping costs must be made. In order to show the approximate cost of a finished lamb under a range of prices for feeder lambs, hay, and grain, the accompanying cost chart has been prepared.

It is apparent that in practically all cases the finished lamb, in order to pay out, must sell for more per hundredweight than his original cost as a feeder. This he will do on a steady market on account of his higher dressing percentage and the higher quality of the mutton. Normally a fat lamb is worth from \$1.59 to \$2 more to the hundred pounds than he was as a feeder.

A further study of the chart shows that with high-priced feed, lambs costing \$7.50 must be sold for \$11.49, a margin of \$3.99, which is more than we could usually expect. A feeder costing \$15, however, in order to pay out, needs to be sold for only \$16.91, or a margin of \$1.91. On the other hand, with feeder lambs at \$15, barley at \$30, and alfalfa at \$10, the finished lamb may be sold for \$13.91, or \$1.09 less to the hundredweight than he cost. This combination of high-priced lambs and cheap feed, however, is a condition that seldom occurs.

COST CHART.—The cost per hundredweight of finished lambs.

	When feed prices are—		
	Barley \$60 a ton; alfalfa \$20 a ton.	Barley \$45 a ton; alfalfa \$15 a ton.	Barley \$30 a ton; alfalfa \$10 a ton.
When prices of feeder lambs per hundredweight are—			
\$7.50.....	\$11.49	\$9.99	\$8.49
\$10.....	13.30	11.80	10.30
\$12.50.....	15.10	13.69	12.10
\$15.....	16.91	15.41	13.91

The profit or loss in any one year of course depends very largely upon market conditions during the feeding period. Just what this will be, no one is able to forecast. As a rule, however, we expect lamb prices to be a little stronger at the end of the winter than they are in the fall, but this is uncertain and on the average does not amount to a great deal. In the long run the fluctuations counterbalance. The feeder must depend for his profit upon the normal margin between the prices of feeder lambs and of fat lambs.

BULLETINS FOR THE FARMER.

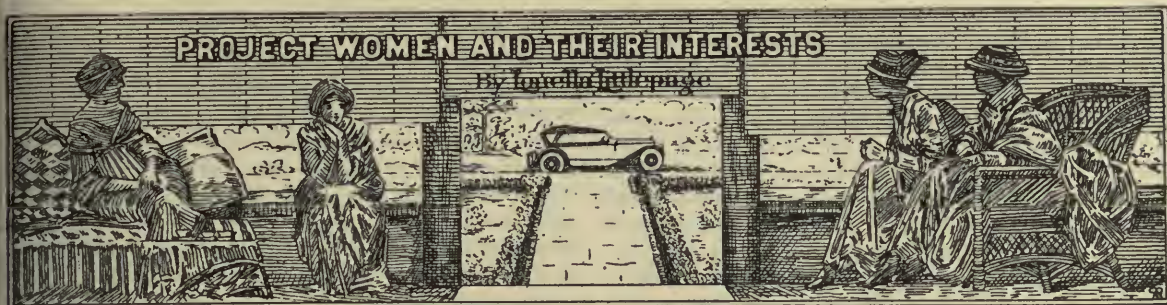
Distributed by the Department of Agriculture,
Washington, D. C.

FARMERS' BULLETINS.

No.

1186. Pork on the farm: Killing, curing, and canning.
1202. An agricultural almanac for 1921.

The farm bureau is practically a public institution, developed at the direct suggestion of agents of Government for the purpose of creating a channel through which the practical results of research work of Government might with certainty reach the people for whom it was intended.



A GROUP of Interior Department employees, in reminiscent mood, were comparing the early spring days to other springs "back home," for Government employees in Washington are gathered from the four corners of the country. Their memories were mostly of swimming and fishing.

"Remember how you used to stand on the bank trying to get up your courage to take the first dive, before you knew just how cold the water was, and whether you had forgotten how to dive, and wondering if you would strike your head, and everything?"

"Yes; and when finally you decided you might as well get it over with before the fellows got to laughing at you how you took a long breath and jumped."

"Remember what a shock the water gave you the instant you touched it, and how you gasped?"

"Yes; but in another instant it was all right and you came back to the surface with your breath in good working order and found the water wasn't so icy and that everything was in pretty good shape."

Most women have about the same group of sensations when they suddenly realize that it is April again and the house is to be cleaned, the garden made, winter clothes put away, and the spring sewing finished; that May, with its May Day, Arbor Day, Mother's Day, Decoration Day, etc., is just around the corner; that preparations must be made for the ceremonies in connection with the close of the school year; and then the crowded summer months with haying, harvesting, and canning time rise up to mock them.

But after all, these really delightful duties only come one at a time and the prospects brighten wonderfully after the first "dive."

It simplifies matters considerably to get winter clothes and hangings put safely away for the summer, and their protection from the festive moth calls for great care.

Thorough brushing should remove all moths and eggs, but hanging for a day in sun and wind is also advisable, then another brushing and the garments are ready to pack away.

It is much easier to bar the moth from your wardrobe than to put him out afterwards and repair the damage. The closet or chest should be thoroughly cleaned. Cedar chests are fatal to adult moths but

have no effect on unhatched eggs. Wrap the garment so that moths can not reach it. This can be done in several ways; sew it in strong brown paper wrappings, use pasteboard boxes, and seal with strips of gum paper, or place the garment in paper bags which are sold for this purpose.

Naphthaline flakes and pyrethrum powder are recommended as two of the most effective remedies known for protecting clothes from moth infestation. Camphor and moth balls are less effective.

Garments which are used from time to time all summer and can not be wrapped, but must hang in the closet ready for unexpected changes in the weather, will keep in good condition if the closet is thoroughly cleaned and the clothes are brushed at regular intervals. Pockets should be turned wrong side out, cuffs down. Brush under lapels and cuffs and at the tops of hems. If possible, hang in a closet with window so that sun and air may be admitted.

While the cleaning season is on it might be well to start a campaign for cement walks. There is no reason why city people should have a corner on good walks, and the constant cleaning required in country homes will be materially lessened if the mud and dirt which is tracked in is eliminated. It will be a constant joy to be able to walk dry shod in any weather to stable, poultry and hog houses, garage, ice and smoke houses, etc. Build the walks only about an inch above the ground, so that the lawn mower will cut the grass along the edges, and use care to make the walks not only convenient but sightly. The expense need not be great, as the work can be done at times when the workmen are not needed in the fields.

Another resolution to be made and kept should also grow out of house-cleaning time, and that is to install a cleaning closet forthwith. In one of the suburbs of Washington there is a modest little home with an attractive lawn in keeping with the high-class neighborhood, but it also has another feature which distinguishes it from every other house we ever saw, and that is a back yard as spic and span and attractive as the view from the street. The little kitchen porch, with its white seats across either end, is screened by cypress vines. In the angle between the porch and house are tall lovely lilies with a low

border of dwarf chrysanthemums. Neither mop nor broom nor unsightly implement of any kind is to be seen. The same tidiness prevails in the well-ordered kitchen, and it was only when the little bride proudly exhibited her "choicest possession" that the problem was solved. It was a closet which she had had built in one corner of her kitchen. There were shelves for all cleaning materials, for bottles and cans, soap and dust cloths, floor space for vacuum cleaner and pails, and hooks for everything that could be hung, including brooms, mops, brushes, dustpan, washbasin, and dish pan, etc. Openings in the door and end of the closet provided ventilation. Of course, she makes a practice also of putting the cleaning implements away clean. It is comparatively easy to keep basins and pails and cloths clean from the start, but after they have been neglected for a while it is a most repulsive task.

Time was when spring house cleaning was a solemn rite, and a dismal time it was, too, with the whole house in disorder. The modern housekeeper has changed all that. She cleans the garret first, then one at a time the various closets, dressers, and chests of drawers, packing away in the garret or storage room the things which will not be needed during the summer months. It is then a simple matter to take first the upstairs rooms and then the lower ones, one at a time, and thoroughly overhaul them.

The Department of Agriculture, Washington, D. C., has issued a booklet on the subject entitled "House cleaning made easier." This booklet will be mailed free upon request while it lasts. Ask for Farmers' Bulletin No. 1180. It contains many practical suggestions which housekeepers will find valuable.

Activities of Women's Clubs.

At the request of one of the members of the Congressional Club, composed of wives and daughters of Members of Congress in Washington, D. C., the RECLAMATION RECORD hereafter will be sent regularly to their clubrooms. Not only will this magazine be of interest to the club members from the West, but to numerous visitors from that section who are constantly visiting Washington.

The Arizona Federation of Women's Clubs will meet in annual convention the first week in April at Miami. A trip to Roosevelt Dam is to be one of the big features of the entertainment planned.

With the Yosemite Valley as a setting, the members of the California Federation of Women's Clubs are promised an unusually delightful time at their twentieth annual convention, May 24 to 28.

Montana club women are raising a fund for the purchase of the painting "Custer's Last Stand," which will be placed in the capitol at Helena.

WESTERN WOMEN TO AID FARMERS.

Western club women have been making an active campaign for a general observance of "Western Consumers' Week," April 10 to 16, which will be observed from Colorado to California.

The Press Chairman of Local Arrangements, who has been making a tour of the States, says that on account of lack of exports the storehouses are filled with canned goods and dried fruits of local production. Unless there is more home consumption of these products of the soil she says the creameries will not run full capacity this summer and the farmers will have no market for their fruits and vegetables. In California she found the women already using California grown rice in every conceivable form; in Washington they are helping to consume canned salmon, which is their important industry. In Oregon everyone was eating prunes to help dispose of 2,000,000 pounds of home-grown fruit, so this year it seems that the women have already started in with a vengeance.

Just think what it will mean if every housewife west of the Rocky Mountains will ask for western goods for one solid week. It will be one big week and prove the power of organization. Eleven States will cooperate.

It is not the purpose of the women to boycott eastern goods. Their motto is "Loyalty to our town, our State, our West makes loyal Americans of us all."

This will be the eighth annual Western Consumers' Week. At that time the women's clubs will devote especial attention to thrift, household efficiency, the value of labor-saving devices, and the study of food values.

The whole theory of Western Consumers' Week is summed up in the following extract from the proclamation issued by the governor of Nevada in 1916:

All our citizens are urged to assist in the upbuilding of our State and the great undeveloped West, of which Nevada is a part, by a general exhibition of loyalty to western products.

Throughout Western Consumers' Week merchants are requested to emphasize the display of local raw and manufactured products and consumers are urged to purchase as far as possible only these products, giving preference in the order named to—

First. The products of the home town.

Second. The products of the State.

Third. The products of the Western States.

During the week the women will study western resources, their growth and development; what electricity is doing for the western housewife; manufacturing in the West; visits will be made to home manufacturing plants; cooking demonstrations, using western products, will be held; bread and baking contests and sales by women's clubs and home economics of the public schools; and lectures on thrift and efficiency in the home will be given everywhere. Merchants and men's organizations will cooperate.

Cooperative Marketing.

Utah held first place in cooperative household marketing during the last fiscal year. The work, organized by home-demonstration agents, proved very popular with the women of the State. In one county 66 local leaders, assisted by home-demonstration agents, made surveys of textile standards and of the durability and service of various pieces of household equipment. After the local groups of women had completed a study of the materials and articles, they pooled their orders and placed them with local merchants or wholesale dealers.

No wonder the work proved popular! A total saving of 35 per cent was made on all money expended on household supplies and equipment.

Another encouraging result of this work is that many merchants have been induced to carry a better grade of goods to meet improved and more critical demands. One local merchant is said to have stated that the standard of his business had been raised 50 per cent by the intelligent buying of the women.

Ask your home-demonstration agent about it. If you are not fortunate enough to have one, appeal to your State college.

The Baby's Bed.

For convenience and beauty nothing surpasses a large, oval clothes basket as a nest for the tiny baby. In fact, it is quite large enough for the first six months and is a real convenience. In it baby may be carried easily from room to room, out on the porch, or under the trees, without taking him from the basket. An umbrella may be used out of doors to protect the baby from sun and wind.

Covered inside and out with cheap pink or blue cambric which is padded with batting, and this in turn covered with a detachable cover of dotted Swiss which may be removed for laundering, and you have a bed fit for a king. An ordinary bed pillow will just fit into such a basket and forms a sort of comfy pad.

Tiny babies should not be handled any more than necessary. The moving of the basket will leave him in it undisturbed; he is not shifted from bed to carriage and back again, and the basket can be placed on chairs beside the bed where it is easily watched over during the night.

Why Not Have a Woman's Exchange?

Every farm woman easily could add a little to her income if a market were at hand, and as there is at least one fairly sizable town on each project it is worth while to talk the matter over and see what can be done. Not only will the establishment of an exchange create a market for the output of clever hands, but it will be an up-to-date addition to the town and serve

as a means of livelihood for some woman or girl who can take charge of it.

What is a woman's exchange? It is a place where finished products, needle work, fancy work, and cookery are sold on commission. Such a department would be an addition to most any store, or some room might be available, or a stall in the market. The woman in charge, besides having an attractive array of articles for sale, could take orders for anything a busy housewife might want.

Foodstuffs—homemade cakes, pies, cookies, breads, pickles, jellies, preserves, honey, etc., each of the best, should be there, so that people buying at the exchange would always know they were getting first-class articles. If one woman would specialize in fancy small cakes, for instance, they would prove profitable and popular. In a short time hostesses would begin ordering small fancy dishes for parties and to want exclusive dishes made to order.

For the busy housewife to whom every cent counts, it would be a good way to earn extra dollars, for it is not much more trouble when baking for the family to make an extra pie or cake or a pan of rolls.

The other interesting part of an exchange is the needlework department. There may be a number of bits of needlework on display, but usually a customer will place an order for what she wants. There are many women and girls who do not claim to be culinary adepts, but who do beautiful needlework. Only the best of its kind should be accepted by the woman in charge and she should be given the privilege of accepting or rejecting, or a committee might pass on the fancywork in order that those pieces carelessly done may be rejected and not be a discredit to the exchange.

In doing needlework it is up to the woman to keep ahead of the style; it is ever changing—crocheting to-day, French embroidery to-morrow, etc. No one knows what will be in favor next, but the woman who can submit dainty bits of handwork in the newest of designs will find this work very profitable.

Among the best sellers in an exchange are baby things. If a woman who sees fresh, dainty baby things hasn't a baby of her own, she is most sure to buy for a friend. Another feature that proves interesting is a doll counter. These are always staple and where individual touches are given are good sellers. Fancy towels, children's dresses, linens, underwear, table runners, bags, aprons, and many other articles are suitable. But whatever one specializes on they should remember that it is the seasonable, sanitary, sensible, daintily made article that will sell and help to make the exchange a success.

I want to again assure you that we find the RECLAMATION RECORD the most interesting magazine on irrigation subjects.—*Cotton & Wilson, Idaho Falls Idaho.*

Reclamation Record Cook Book.

OATMEAL COOKIES.

(By Mrs. M. E. Reed, stenographic section, Washington, office.)

3 cups oatmeal.	1 cup sugar.
3 cups flour.	1 cup butter.
5 tablespoons milk.	1 cup English walnuts.
1 teaspoon soda.	1 cup raisins.
2 eggs.	

Dissolve soda in milk. Beat eggs separately. Mix dry ingredients, add to milk, then add egg yolks and whites, melted butter, chopped nuts, and raisins. Mix well, mold with hands, and bake in moderate oven.

RINK-TUM-DITTY.

(By Mrs. Anne Lamb, stenographic section, Washington office.)

1 can tomato soup.	1 egg.
$\frac{1}{2}$ pound cheese chopped fine	1 tablespoon butter.

Put butter in frying pan over slow fire. When melted add cheese and stir cheese and butter until sort paste. Then add soup, pouring in very slowly and stirring constantly. Last of all add beaten egg, salt, pepper, etc. Pour over crisp toast or crackers.

MACARONI AU GRATIN.

(By Mrs. Dorothy Rankin, colorist, Washington office.)

$\frac{1}{2}$ pound chopped cheese.	$1\frac{1}{2}$ cups milk.
1 tablespoon butter.	$\frac{1}{2}$ package macaroni.
1 tablespoon flour.	

Boil or blanch macaroni, melt butter, add flour, cheese, and lastly, slowly, milk. Cook until thick and creamy. Season with salt and pepper and dash of cayenne. Place macaroni in baking dish, pour cream sauce over, sprinkle with bread crumbs, dot with butter, and brown in oven.

SPANISH CREAM.

(By Mrs. C. B. MacMullen, auditing section, Washington office.)

6 eggs.	1 quart milk.
$\frac{1}{2}$ box Knox or Chalmers gelatine.	1 cup sugar.
	1 teaspoon vanilla.

Boil milk and gelatine. Set to cool. Stir in yolks of eggs and sugar and boil a few minutes longer. Beat whites of eggs to stiff froth and stir in and beat hard.

Pour in small individual molds and serve cold with cream.

This is sufficient for family of seven or eight.

CRULLERS.

(By Mrs. C. B. MacMullen, auditing section, Washington office.)

1 cup mashed potatoes.	2 tablespoons shortening.
1 large cup sugar—one-half brown and one-half white.	2 eggs.
1 cup sweet milk.	3 teaspoons baking powder.
	Salt, nutmeg, flour.

Roll soft.

FROZEN LEMON PUDDING.

(By H. T. Cory, former consulting engineer.)

Mix yolks of four eggs and 2 cups of sugar; stir 20 minutes in double boiler.

Previously mix, so as to be cold when the yolks and sugar are ready to take off the stove, two spoons Knor's gelatine in one cup hot milk to dissolve.

Mix gelatine and milk when cold with the beaten whites of four eggs and 1 pint of cream. Grate peel of one large lemon, add juice of two lemons, pour in contents of double boiler and freeze.

RECLAMATION DIVINITY.

(By R. F. Walter, assistant chief engineer, Denver office.)

Part 1.

3 cups sugar.	$\frac{3}{4}$ cup cold water.
1 cup Karo sirup.	$\frac{1}{2}$ teaspoonful salt.

Cook until a hard ball is formed, when put in water, then add the beaten whites of three eggs. Beat hard a few minutes, and when it begins to cool add 1 cup nut meats.

Part 2.

1 cup sugar.	1 pinch cream of tartar.
$\frac{1}{2}$ cup cold water.	

Cook without stirring until soft ball is formed, when put in water, then pour over part 1 and beat until it begins to harden. Drop by spoonfuls on oiled paper or buttered dish. Part 2 should be put on fire a few minutes later than part 1.

PRUNE PUDDING.

(By E. E. Roddis, district counsel, Denver office.)

Mix one tablespoonful butter with $\frac{1}{2}$ cup hot prune juice.	$\frac{1}{2}$ teaspoon salt.
$\frac{1}{2}$ cup dark corn sirup.	$\frac{1}{2}$ lemon rind grated.
3 tablespoons lemon juice.	$\frac{1}{2}$ cup stale bread crumbs moistened with water.

In a greased baking dish arrange alternate layers of moistened bread crumbs and chopped cooked prunes, using in all 3 cups of the prunes. Pour the liquid over this and bake in moderate oven for 45 minutes to 1 hour.

"A Penny for Your Thoughts."

By Mrs. Margaret Crews, Tieton, Wash.

A short time ago I was driving slowly along, deeply engrossed in some of those thoughts which it pleases my fancy to think that if it were possible for our fellow men to discern there would certainly be a furore created in many an otherwise placid life, when a neighbor who was pruning his orchard at the roadside cheerily called out, "A penny for your thoughts." Of course, that broke the spell, and I was brought suddenly back to earth.

Now, I'm going to give free vent to some thoughts I had recently as I was being entertained at the

annual party given by the Tieton Mothers' Club to their husbands at the home of Mrs. and Mr. C. K. Garey, the house of seven gables, near Tieton.

Of course, every water user knows of this fine club, the splendid, far-reaching influence it spreads, and all that, and how occasionally and sometimes semi-occasionally the husbands are invited, and a very special program and more than very specially good things to eat are prepared, and mother gets a glimpse of father again in his "biled" shirt and altogether best bib and tucker.

Well, to make it snappy, on just this occasion we were invited to Mr. Garey's, traveling over roads over which we, like Rachel for her children, "wept because they were not." The house was filled with the hundred guests, and not only was the house filled with folks, it was filled with lights, music, lovely things to look at, good fellowship, laughter and love, and things to eat and to drink. Oh, yes; real cider in a great punch bowl, presided over by fair women and religiously or otherwise attended by brave men. And 'tis just here where "penny-for-your-thoughts" idea occurred.

Of course, too, every water user knows this special Tieton Mothers Club is the foster daughter of the Tieton project, and the melting pot for those socially inclined, who were wise to their best interests

when they decided to make this their home. I looked at that group of men, first just as a lot of animals corralled; and much as an appraiser sizes up a bunch of spirited cayuses, so I sized them up—our husbands. Some of the thoughts I wouldn't have sold; some I want to give away. "Yes," I thought, "you've come from nearly every State in the Union—it being a 'State' party. You've brought your native ideas, your State prides and prejudices, your provincialisms, your own individualities, your fortunes, your families, your all. You've put them on the altar of progress. Your hopes, your ideals, your doubts, your fears are here. You are a queer looking lot, and a queer acting lot. Men are all queer, anyway." As I looked I thought of my neighbor's salutation, "A penny for your thoughts."

All the ambitions, the motives, the passions, the hopes of mankind were present in that group of men. And it is not given us to discern them, and were it possible to do so society would be a chaotic inferno; and then I thought, O men and brethren, there is One who knows, who pities, loves, and condemns. But this is the thought I brought home with me: There is not a finer, cleaner, braver, nobler, truer lot of men within God's great universe than these Tieton men, fathers and husbands of the members of the Tieton Mothers' Club.

Diary of a Western Boy in Europe—Continued.

By William E. Smythe, jr.

VI. CUSTOMS OF OLD ENGLAND.

OFTEEN when reading "Pickwick Papers," "David Copperfield," or other novels portraying England in the olden times, I have wondered if the customs of that country to-day are the same as those of America, or whether they still slightly resemble the times of which Dickens wrote. Both these questions might be answered in the affirmative with perfect truth.

To the casual visitor who lands in Liverpool, takes a fast train to London, and another one, perhaps, to some large city in Scotland, and from thence by a train equally fast goes to some port where he may embark for the Continent it presents a picture which is essentially modern. He sees the up-to-date docks, travels in a taxicab which is probably of Detroit manufacture, journeys in a train which may seem original to the American but is obviously trying to compete with the "Twentieth Century Limited" for speed, lands in a London fundamentally old, yet which is evidently masquerading with speeding motor trucks and well-advertised picture shows.

His comment on England, which he has visited along with several other foreign countries, is often:

"Oh, the people of England seem to be trying to be modern, at least they make a stab at it; but they have such queer, old-fashioned ways of saying everything that I can hardly tell whether they are trying to keep up with the procession or are unwillingly dragged along by the march of civilization."

But he who cares to get a bit off the beaten paths and see the smaller towns will find an old England which fills his heart with romance and refreshes his mind with sights and sounds that set even an American to dreaming of olden days when Barkis was "willin'."

I shall never forget one stormy evening close to 6 o'clock. I had been cycling for hours beneath leaden skies. I was tired to the limit, but, fortunately, was only a mile from the small town of Dunchurch. The land was rolling, and green fields, separated by hedgerows, were on both sides. Consequently I saw no trace of a village until, rounding a sharp curve, I began to ascend a hill. I dismounted from my cycle and continued on foot.

It was Thursday, and Thursday afternoon is the holiday time for the working people of Eng-

land. A crowded "brake" passed me on its return trip to Coventry, the four horses traveling at a lively trot. Children protruded from its lengthy sides waving British flags and tooting shrill tin horns. The whole went by me in a flash, yet it gave a glimpse of one of the simpler pleasures that are so thoroughly enjoyed by the British people. They make much of the fresh air and open spaces, these tollers of the city.

I soon found myself on the green of a small village. All around me were low buildings with thatched roofs; there were the church, two shops, a number of houses, and the Dunn Cow Inn. I entered the courtyard of the inn, "parked" my cycle against the wall, and, going in, inquired for a room, "whereupon a clerk took my clumsy pack and directed the "boots" to take care of my cycle. I was then shown up a broad staircase decorated with stuffed birds and animals into a spacious room, the door of which he unlocked with an immense rusty key. The room contained a large, four-poster bed, a wide fireplace, a writing desk, washstand, and several chairs.

Having settled my belongings, I walked out to see the town. Entering a small grocery store, I called for a lemon soda. The white-haired lady behind the counter said she was out of that particular beverage, but especially recommended American ice-cream soda. This I knew to be merely charged water, flavored with a delicate perfume and some milk. However, I drank it with great gusto, while petting a beautiful Persian cat that strode up and down the counter, lord of all he surveyed.

Leaving the store, I took the road toward Coventry for about half a mile. I passed numerous small cottages set well back from the road. In front of these homes were neat gardens, gay with hollyhocks and the commoner varieties of flowers. Dunchurch is not on a railroad, but is connected with both Daventry and Coventry by a line of buses much like those we use in this country. These buses, together with numerous motor cars, passing constantly through the main streets, are the only really modern objects to be seen; although, as in the rest of England, bicycles are to be seen everywhere. Several passed me on my walk, some of which were tandems. Many a man and wife depend on these for their daily airing, as well as for their practical transportation.

Returning from my walk, I went to the inn for supper and then in search of amusement. Following the sounds of an accordion, I entered a "pub" on the opposite side of the green. The scene was typical. Facing the door was the wet bar, on which was a goodly array of partly or fully emptied glasses of different shapes and sizes. Behind the bar were three handles that controlled the flow of different kinds of ale; an elderly woman and two young men served the drinks as fast as possible. The

room was filled with men and women who stood around in groups, sat at the rough tables, or clustered about the roaring fireplace which occupied one end of the room. A man sat on one of the tables and played a lively tune on an accordion, to which few paid the slightest attention.

I ordered a pint of cider and sat down to join in the conversation. Everyone was talking of the great fair that was to open the next day at Coventry. Nearly all of them had some animal to exhibit or knew some one who owned a prize winner. One short, red-faced woman stood at the corner of the bar holding a pitcher of ale in her left hand while she poured down a glass of "Scotch" with her right. An acquaintance spoke to her:

"Drinkin' again, old woman?" he questioned gaily.

"No, sir," she said with a smirk; "I just stopped by to get some ale, an' I couldn't 'elp 'avin' a drink to my prize hog."

One man at a table asked his friend if he was taking "Jenny" to the fair on the morrow.

"I am that," he replied; "and I've been havin' the devil's own time with her. I groomed her all afternoon. I didn't even stop for tea."

The latter part of his remark was startling in the extreme, for a man to neglect his tea in England is almost unheard of. Every man, woman, and child has tea at a regular hour. Sometimes they go without breakfast, dinner, or supper, but never without tea. The miner goes to his shaft carrying his pot of tea; the business man has tea served in the office; the women have tea in the home; but they all have tea.

Finally, I got to talking with a man on the subject of the similarity of English and American songs. He quite agreed with me, and I asked him if they had used the same war songs that our doughboys did. He said they did to a large extent; in fact, that one of the most popular war songs was that "Glory Song." By this he meant, "The Battle Hymn of the Republic." As I walked back to the inn I could picture in my imagination those ancient streets filled with marching soldiers on their way to the World War, singing:

Mine eyes have seen the glory of the coming of the Lord;
He is tramping out the vintage where the grapes of wrath are stored;

* * * * *

Oh, be swift, my soul, to answer Him! Be jubilant my feet!
Our God is marching on.

I put out the light in my room just as the last notes of the 11 o'clock chimes were dying upon the peaceful night.—*L. L.*

The county farm bureau was created and has become, essentially, a public institution very much like a college of agriculture.

BLACKLEG THREATENS YOUNG CATTLE.

By U. S. Department of Agriculture.

BLACKLEG in cattle is prevalent in many parts of the Government's reclamation territory at this season of the year, and is another of the diseases for which no effectual cure has yet been discovered; but it can be prevented to a large degree by precautionary measures. Although less widespread than tuberculosis or hog cholera, it causes annually the loss of thousands of valuable animals. It is one of the most insidious diseases in its spread, the germs being disseminated on pastures by improper disposal of dead animals. Cattle between 6 months and 2 years of age are the most susceptible. Death is practically certain, and every precaution has to be taken to prevent contagion once the disease gets into the herd.

Blackleg, black quarter, or quarter ill, which also has several other names, is a rapidly fatal infectious disease of young cattle, with external swellings that emit a crackling sound when handled. This disease formerly was regarded as identical with anthrax, but investigations by various scientists in recent times have proved definitely the entire dissimilarity of the two.

NOT FOUND EVERYWHERE.

Like anthrax, blackleg is more or less restricted to definite localities. There are certain pastures upon which the disease appears regularly in the summer and fall. It occurs in this country from the Atlantic to the Pacific, and from Mexico to Canada, but it is more prevalent in the Western and Southwestern States, especially in the high ranges.

The cause of the disease is a bacillus resembling in some minor respects the anthrax bacillus, and differing little from it in size. It also has the power of forming within itself a spore which resists destructive agents for a considerable time, and still produces disease when inoculated after several years of drying. Thus, it lurks in old pastures and has been found in the mud of swamps.

The spores develop only where air is excluded, and usually are communicated through small wounds penetrating the skin and by injection of infected feed. Such wounds may be caused by barbed wire, stubble, thorns, briars, or even pointed parts of feed.

HOW TO DISTINGUISH BLACKLEG.

The symptoms may be either general or local, though more frequently local. They begin from one to three days after the infection with a loss of appetite and rumination, with dullness, debility, and high fever, the temperature sometimes rising to 107° F. To these may be added lameness or stiffness of one

or more limbs, due to a tumor or swelling frequently accompanying the disease. Death follows quickly, preceded by increasing weakness, difficult breathing, and occasional attacks of violent convulsions.

The most important characteristic of this disease is a tumor or swelling under the skin a few hours after the setting in of the constitutional symptoms. This tumor may be on the thighs, neck, shoulder, breast, or flanks, but never below the knee or hock joints. The tumor, at first small and painful, spreads very rapidly in depth and extent. When it is stroked or handled a peculiar crackling sound is heard under the skin. This is due to a collection of gas formed by the bacilli, as they multiply. The skin becomes dry and cool to the touch, and if the swelling is cut open a frothy, dark red, rather disagreeable-smelling fluid is discharged. The animal manifests little or no pain during the operation. A post-mortem examination of the animal which has died of blackleg will reveal the tissues under the skin infiltrated with blood and yellowish, jellylike material and gas bubbles. The muscular tissue beneath the swelling may be brownish or black, shading into dark red. It is soft, easily torn and broken up. The muscle tissue is distended with numerous small or gas-filled cavities.

A number of drugs have been recommended by various writers as a remedy for blackleg, but all have been found valueless. Nearly all animals which are attacked die despite every treatment. Attempted curing by opening and treating the tumors direct is to be condemned because it tends to spread the germs upon the ground, and leads to further contagion.

VACCINATION IS BEST PREVENTIVE.

The only remedy, as has been said, is prevention, and the best preventive method is vaccination, which has been thoroughly tried and proved to be efficacious. The powder vaccine is obtained from animals which have died from blackleg by cutting the affected muscles into strips and drying them in the air. When they are perfectly dry they are pulverized and mixed with water to form a paste, smeared in a thin layer on flat dishes, placed in an oven, and heated for six hours at a temperature close to that of boiling water. The paste is then transformed into a hard crust, which is pulverized and sifted, and distributed in packages containing either 10 or 25 doses.

The strength of the vaccine is thoroughly tested on experimental animals before it is distributed among cattle owners. This vaccine is mixed with definite quantities of sterile water, filtered, and injected under the skin in front of the animal's shoulders. The immunity conferred may last for 10

months, but animals vaccinated before they are 6 months old and those in badly infected districts should be revaccinated before the following blackleg season.

Aside from the powder form of vaccine as mentioned, other and newer methods of immunization are now in use. The use of blackleg aggressin and blackleg filtrate as made by various biological manufacturers is to be recommended. The aggressin—the most expensive of these products—is without doubt the most potent product obtainable, while the filtrate, if fresh and properly prepared, is perhaps the second best product. The powder vaccine is the oldest product in use, but it has an enviable record for the good it has done.

OTHER METHODS OF PREVENTION.

Vaccination has reduced the losses by blackleg from 10 per cent in an ordinary year to less than one-half of 1 per cent. While vaccination is a treatment best administered by skilled veterinarians, there are other preventive methods which may and should be practiced

by the reclamation farmer if he is in a blackleg region. It is of prime importance that animals be removed from an infected pasture to a noninfected field. Swampy ground should be drained; carcasses of animals that have died from the disease should be buried deeply or burned to prevent dissemination of the germs over vast areas through the agency of dogs, wolves, buzzards, or crows. Stables should be disinfected, and also the ground where the animals lay at the time of death, and possible germs should be destroyed in the infected pastures.

One of the most effective methods of doing this is to allow the grass to grow high on the pasture, and when sufficiently dry to burn it off. One burning is not sufficient to disinfect an infected pasture, but the process should be repeated several years in succession. This method is in many instances impracticable, as few cattle owners can afford it, and the only means left for the protection of the animals is vaccination.

Further specific information can be obtained by application to the United States Department of Agriculture, Washington, D. C., or to your county agent or State live-stock authorities.

CARE OF BABY CHICKS.

By H. O. Numbers, Poultry Expert, Loretto, Pa.

THIS is an opportune time to suggest a few precautions for the care of baby chicks. Every year they die by the millions and poultry raisers wonder why. If a chick comes out of the shell sound and healthy it will not die from natural causes, but, on the other hand, very often meets a speedy death at the hands of an inexperienced poultryman through his ignorance of what this frail little fluffy bit of feathered life requires. A few suggestions, based upon 15 years of practical experience, may be helpful.

The chicks are left in the incubator for 72 hours from the time the first one breaks the shell. This gives the chick a chance to properly digest and assimilate the ration which nature provided in the form of yolk, for its first three days' existence. After 72 hours there is no fear of stomach or bowel trouble. The chicks are then placed in brooders, in which one-half inch of sand covers the floor. The reason for the sand is that any other litter soon becomes soiled and the chicks will invariably eat it to their detriment. Chick grit is sprinkled freely on the sand, and this is their first feed. The drinking vessels are thoroughly sterilized. The first drink, and for three weeks following, is lukewarm water with one teaspoonful of lime water to the quart. After the chicks have been in the brooder for several hours and have eaten a quantity of grit, cardboard or heavy paper is placed around the brooder floor on top of the sand and the chicks are fed lightly a mash feed of bran,

oven-dried bread and corn meal—equal parts by weight. To this are added the yolks of hard-boiled eggs which have been tested from the incubator during the hatch. One yolk is used to a handful of the mash. Feed as much as they will clean up, no more. When closing for the night take all particles of food from the brooder. Do not mix a large quantity of the mash with the yolks, as it won't keep. Mix the yolks with the mash only as fed. There are a number of good chick mashes on the market, and, if procurable, feed one of these instead of the home-made formula. It will cost more, but will save much time. Feed no grain for four days, then very sparingly. In addition to the dry mash (we have never had any success with wet feeds), we feed the following three times daily: Equal parts by weight of cracked corn, cracked wheat, and cracked oats (steel cut). Be sure that all the meal is screened from the scratch feed. If it is not, it will sour in the litter. After one week we feed oats sprouts clipped fine. Milk curds or buttermilk are excellent bowel regulators. We feed all the chicks will use when available, and they are not troubled with lax. We do not give sweet milk, as we have never had any success with it. Let the milk get thick, then feed the curds, or cheese only.

The temperature in the brooders runs as follows: 98° the first week, 94° the second, and 90° the balance of the brooding time. Leg weakness must be

carefully guarded against. A teaspoonful of lime water to the quart of drinking water daily and plenty of greens constitute one of the best preventives. Do not let your chicks get overheated, chilled, or wet. If you do, you might as well quit as there is no remedy.

The care of baby chicks is a subject not to be dealt with briefly, and if our egg production next fall is to run high we must start right now to lay the foundation in the 72-hour chick, and keep the chick growing. If it is maltreated for a few hours its progress will be checked and you will bear the loss.

A PROJECT CITY'S PROGRAM OF WORK.

THERE has come to our attention recently the Official Bulletin of the Commercial Club of Williston, N. Dak., on the North Dakota pumping project, which carries a message in its "program of work" that in many respects is so applicable to other cities and towns on our project that we are quoting it in full. If all our projects would conscientiously try to put this program into effect, so far as it applies to their own peculiar conditions, the few knockers still remaining would take a back seat for good and the prosperity of all would be practically assured. We only hope that Williston is practicing what she preaches, for the preaching is good. Here it is:

MAJOR PROGRAM.

1. *Good roads.*—Work in every possible way for road maintenance and for more improved roads leading into Williston in order that the city may be more easily accessible to the surrounding country, especially to its better trade territory.

2. *Irrigation.*—Cooperate with the Williston Water Users' Association in the development of the Williston irrigation project in securing new settlers and encouraging better farming methods.

3. *Parks and playgrounds.*—Urge the early election of a park commission and cooperate with it in the establishment and improvement of parks, boulevards, playgrounds, and athletic recreational facilities.

4. *Markets.*—See what can be done to make Williston an attractive market center for farmers and residents of adjoining towns, with the further idea of establishing a public market and special sales days.

5. *Schools.*—Support the school authorities in their endeavors to broaden educational opportunities, including new facilities, favorable legislation, and other necessary features.

6. *City beautification.*—Secure cooperation of all in a general "clean up" and beautification of the city, through the better cleaning of streets, alleys, and vacant lots, better street lights, improvement of landscape on lower Main Street, and bringing about more sanitary conditions.

7. *Immigration.*—Aid in the agricultural development of Williams County by advertising and co-operating with existing agencies to bring in desirable settlers and getting them situated.

8. *Entertainment.*—Provide good entertainments during the year such as chautauquas, automobile shows, and celebrations, that will make Williston the logical entertainment center for this section of the State.

FORUM PROGRAM.

1. *Cooperation.*—Promote a more congenial spirit of cooperation among people of the city and between the city and the country.

2. *Dairying.*—Find a feasible plan to cooperate with the farmers in bringing more and better dairy cows into the country, and improve facilities for manufacturing and marketing dairy products.

3. *Industrial development.*—Bring to the fore the industrial and commercial benefits that can be derived through utilization of local electric power and the ideal resources for development of clay products, beet sugar, and other industries.

4. *Improved streets.*—Urge and aid in planning a comprehensive program of street improvement in the city, including the paving of a section of the business streets.

5. *Potato raising.*—Study advisability of more extensive cultivation of potatoes in this community, and see what can be done to promote a good potato market.

6. *Rest room.*—Make a study of methods used in other cities in establishing and maintaining a rest room, and see whether plans could be worked out for one at Williston.

7. *Agriculture.*—Seek plan of cooperation with farmers to stimulate interest in agriculture and increase of production.

Additional suggestions include municipal regulation and service, civic improvement, publicity, and miscellaneous items.

The growing of sorghum for forage in this country has increased until the 1918 crop amounted to more than 5,000,000 acres.

In order to put at the disposal of farmers information which will enable them to place their farming operations on a more businesslike basis, the United States Department of Agriculture has conducted extensive studies in farm business analysis.

TAKING THE MYSTERY OUT OF MARKETING.

By C. B. Sherman, Assistant in Market Information, Bureau of Markets,
United States Department of Agriculture.

PRODUCERS who sell to a local market are usually familiar with such processes as are involved and frequently are confronted with no real problems in thus disposing of the results of their labor. Those who ship to distant markets, however, often feel that they lose all control over their property as soon as it leaves their hands, and the resulting check often seems to them to represent a very inadequate and sometimes unfair return. One of the main functions of the United States Bureau of Markets is to throw light on the intricacies of marketing processes in such a way that a farmer may follow the fortunes of his product ever further along its complicated journey to the consumer.

KNOW YOUR MARKETS.

In former years producers usually shipped their crops to the same market all during the year, and year after year. Moreover, they shipped whenever the crop was harvested, regardless of the state of the market. These methods resulted in glutted markets and consequent ruinous prices for perishables in some cities when there were scarcity and high prices at others. Since the Federal market news services have been developed it has been possible for producers of the principal classes of live stock, of dairy products, and of the principal fruits and vegetables to obtain impartial, disinterested information regarding movements, prices, and conditions at the large markets in advance of shipments, so that produce can be directed toward promising outlets and at promising times.

This information is sent out in several ways. For those who wish to keep in closest touch with some specified commodity there are daily, weekly, and monthly mimeographed reports available on request. Such reports are issued in connection with fruits and vegetables, live stock and meats, dairy and poultry products, peanuts, and honey. More general information is issued weekly in popular, narrative style with tables and graphs in *The Market Reporter*, a 16-page, printed weekly, publication which is sent free of charge to all who request it. Recently the bureau has developed a marketgram service through which summaries of market conditions at the important producing and consuming centers are transmitted by telegraph to its branch offices and thence released immediately to farm papers and other publications on the day they go to press. These summaries cover the markets for the week ending on day of issue. More than 5,000 such publications receive and publish these reports, including several foreign-language journals.

Most of these papers state specifically that the notes are from the United States Bureau of Markets and the readers are thus assured of the impartiality of the information. Any newspaper or farm journal that is not now publishing the marketgrams would probably be glad to arrange to do so if its subscribers asked for the service. Local banks will some times arrange to receive some or all of the bureau's reports on the commodities of their region for the benefit of their clients and will sometimes undertake to interpret them when necessary.

GRADE YOUR PRODUCTS.

The Far West was one of the first agricultural sections to realize fully the value of a graded product and to put this realization into active practice. The result is that California citrus fruit and apples from the Pacific Northwest have virtually entered the markets of the world.

Unorganized farmers are grading their products more and more as the benefits become increasingly evident to them. Through grading the producer is enabled to apply market information to his own stock to find a more ready market for his product, to secure more nearly the value of the actual goods sold, and to retain for use on the farm that part of his crop which will not bring a profit beyond transportation and handling charges.

Under authority of Congress the Bureau of Markets has established mandatory standards for shelled corn, wheat, oats, and American cotton, and has developed recommended standards for northern-grown and Bermuda onions, white potatoes, and sweet potatoes which have been issued in bulletin form, and tentative standards for cabbage, celery, asparagus, and tomatoes are now being tried out by interested sections of the trade.

SHIP WITH CARE.

Frequently 20 per cent of such perishable commodities as apples or tomatoes are lost on account of freezing or because shipped at the wrong stage of maturity. Other heavy losses occur because of improper loading, cooling, or ventilating processes in transit. This loss is a heavy tax on both producer and consumer and a cause of great discouragement to the shipper. The Bureau of Markets has made extensive investigations in these matters largely in cooperation with the United States Railroad Administration, which endeavored to put results into practice as



TAKING THE MYSTERY OUT OF MARKETING



- 1 FARMERS ASSEMBLING LIVE STOCK FOR CARLOAD SHIPMENT
"COOP-UP RATE IF EXPEDIENT."
- 2 FOOD PRODUCTS INSPECTOR AT WORK.
"PROTECT YOUR INTERESTS."
- 3 PREVENTABLE WASTE
"SHIP WITH CARE."
- 4 POTATOES SO GRADED FIND A READY MARKET
"GRADE YOUR PRODUCTS."
- 5 CANTALOUPE SAFELY PACKED FOR A TRANSCONTINENTAL JOURNEY
"SHIP WITH CARE."
- 6 REPORTING THE MARKETS
"KNOW YOUR MARKETS."



U.S. DEPARTMENT OF AGRICULTURE

rapidly as practicable. Specifications for loading sacked potatoes were worked out which have made it possible practically to eliminate former very heavy losses caused by improper loading. The necessity of using strong and suitable containers has become most evident, and shippers are urged to give careful thought to the preparation of their products for distant shipping.

Plans and specifications for a standard refrigerator car were drawn up and the car proved to be such an improvement over existing types that the Railroad Administration adopted it as standard, and practically all of the refrigerator cars built or rebuilt in the United States in the past three years have been constructed in approximate accordance with these specifications. Efforts are now being made to perfect a means for heating the standard refrigerator car in cold weather.

Bulletins are available to the shipper giving suggestions for improved methods of preparing, loading, bracing, and shipping potatoes, cantaloupes, strawberries, and grapes, and first-hand suggestions are available through correspondence regarding other commodities based on investigations whose results have not yet been published.

PROTECT YOUR INTERESTS.

If a shipment of perishables is rejected when it reaches a large market and the shipper feels that the rejection is unjust or if the claim is made that the condition of the shipment is unsatisfactory and the shipper believes the goods to have arrived in good shape, he now has recourse to an unbiased inspection service developed for the purpose. Through the Food Products Inspection Service the Bureau of Markets has stationed inspectors at 25 of the largest markets. These inspectors make thorough investigation of the shipments in question and issue certificates setting forth the quality and condition of the products involved, and the law has provided that these certificates be accepted as prima facie evidence in all United States courts. This service is also available to the railroads and dealers or to any party who is financially interested in the shipment and the resulting certificates may be used to settle any dispute regarding quality and condition of the products.

A small fee is charged for each inspection. This fee is \$4 for any lot more than half a carload up to a full carload, and \$2.50 for any quantity not more than half an ordinary carload. Inspections will be made at smaller markets near headquarters if the applicant will pay the actual expenses incurred by the inspector in making the trip, in addition to the usual fee. This inspection work is solely a service for the benefit of the public, and no inspections are made unless specifically requested.

COOPERATE IF EXPEDIENT.

Cooperation may play an important part in the satisfactory marketing of farm products. One of the simplest and most readily successful forms is that of combining to make carload lots for shipments, thus gaining advantages which the small shipper alone can not hope to secure. The flourishing cooperative organizations developed by some large groups of producers for actually placing their products on the wholesale or retail market or even in the hands of consumers are very encouraging manifestations. Organization along such lines should be conducted conservatively, however, for close study of achievements and failures proves conclusively that certain definite principles must be observed if success is to follow.

Success in cooperative marketing depends upon obtaining and maintaining steadily a specified volume of business, observing true cooperative principles from beginning to end, employing capable management, which usually means the payment of at least one good salary, following up-to-date business methods equivalent to those used in a successful merchandizing establishment, and having truly loyal members who will support the enterprise as readily during periods of depression as during those of prosperity.

The Bureau of Markets stands ready to help in so far as practicable in any of these matters, and further details on any of these lines of work will be supplied on request. Other studies along similar lines are under way which are calculated to throw further light on the vexed question of marketing.

RECLAMATION ABROAD.

National Irrigation Congress to Be Held in Spain.

A national irrigation congress is to be held April 18 to 27, in Valencia, the purpose of which is to create interest in the development of irrigation in Spain. Previous congresses of this nature have been held at Saragossa and Seville, in 1913 and 1918, respectively. On account of the long period of drought, with heavy rainfall during certain portions of the year, Spain offers unusual possibilities for irrigation improvements. Expositions of model irrigation and drainage plans are being presented at the congress, as well as various types of engines for raising and utilizing water, hydraulic plants, etc. Although this is a national congress, foreigners are admitted under equal conditions with Spanish interests.—*Commerce Reports.*

To-day I chanced to pick up an issue of the RECLAMATION RECORD of November, 1920. It's worth the money.—*Eli Auchmoody, San Pedro, Calif.*

MALTA HIGH SCHOOL, MILK RIVER PROJECT, MONT.¹

By O. E. McDowell, Superintendent.

THE steady growth which Malta has made may well be read in the history of her schools. Her first school of 10 pupils was organized in 1892, at which time bonds were issued for \$1,000 and a small one-room building was erected. In 1900 bonds were again issued for \$8,000 and a two-story four-room brick building was erected. Here the first high-school classes were started. When the school had outgrown this building a small one-room frame structure was built as a temporary expedient and bonds were again issued in 1914 for \$24,000 for a new 10-room building. In 1915 the entire school system was moved into the new building. The faculty at this time consisted of five grade teachers and three high-school teachers.



Upper: Malta High School, built in 1920.

Lower: Malta Grade School, built in 1915.

By the spring of 1917 Malta District had grown from a third-class to a second-class district and was entitled by law to hire a superintendent for the city schools. One year later it was necessary to remodel the old brick building and move four of the grades over to make room for the rapidly growing high

school, and in the fall of 1919 both buildings were badly overcrowded.

In spite of the preceding years of drought, the high cost of material, and the depressed bond market, the board of education bravely faced the situation and in December, 1919, passed the resolutions providing for a new bond issue. It is a matter of considerable credit to the voters of the district that the bond issue was passed in the election by an overwhelming majority.

Plans were immediately drawn and early in the spring of 1920 contracts for the new building, amounting to approximately \$80,000, were let. The work of construction was begun on May 3 and the building was dedicated on October 29.

The large assembly room with its stage, dressing rooms, moving-picture booth, and other equipment is one of the finest and best arranged in the State.

The cooking room, dining room, pantries, and sewing room occupy one entire wing of the building directly off the assembly room, and are furnished with the best equipment to be obtained.

The library is conveniently located at one end of the assembly room, where it is easily accessible at all times and always under supervision.

On the first floor below the assembly room is a modern gymnasium with floor only slightly below grade line and a wide corridor on the first-floor level serving as corridor and spectators' gallery. Dressing rooms, cloakrooms, lavatories, locker rooms, and showers for girls and boys are placed symmetrically at opposite ends of the gymnasium.

To meet an increasing demand for commercial courses in the high school, rooms especially planned for bookkeeping, shorthand, and typewriting were built in on the first floor directly adjoining the offices and supply room.

The science laboratories were designed for chemistry, physics, and general science.

In addition to these specially designed rooms there are seven classrooms and a ladies' rest room.

The manual-training shops have been installed in the old brick building on the same lot, where there are separate rooms for bench work, machine work, stock room, and finishing department.

Some of the outstanding features of the building deserve special mention. The amount of usable floor space is quite large compared with the outside dimensions, owing to the absence of wasteful corridors on the second floor and the double use of corridors and spectators' gallery on the first floor.

All the special departments have specially designed rooms and equipment.

All rooms used for strictly school purposes are

¹ Reprinted, in part, from Great Falls Daily Tribune.

above grade line, where light and ventilation are the very best.

The building has the advantage of a low fire hazard owing to its fireproof construction and numerous exits, yet avoids the necessity of expensive fire escapes.

The seventh and eighth grades have been organized into a junior high school, placed upon the same schedule with the senior high school, and seated in the same assembly, where they have the advantages

of the library, laboratories, shops, and gymnasium as well as the opportunity to enter into high-school activities.

In order to stimulate school spirit and encourage wholesome literary, athletic, and social activities the students have been organized into a student association with an executive council of student and faculty members for the purpose of supervising all student activities.

OPERATION AND MAINTENANCE COSTS AND ACCRUALS.

For the information of our water users, the accompanying tables have been prepared showing, by projects, the status of operation and maintenance costs and returns.

Table 1 shows the amount of the reclamation fund invested in project operation and maintenance on December 31, 1920. The last, or total, column of this table shows the amount of money advanced by the

Government in operation and maintenance, which has not been returned by the water users.

Table 2 shows the results of the 1920 operations based on net costs and accruals for that year.¹

Table 3 gives a comparison between the estimated and actual results from operation and maintenance, by projects, for the current calendar year. This table will be published monthly.

TABLE 1.—*Net investment of reclamation fund for project operation and maintenance, Dec. 31, 1920.*

Project.	Cost deficit.	Cost surplus.	Value of equipment and inventories.	Uncollected accruals prior to 1920.	Total.
PUBLIC NOTICE PROJECTS.					
Belle Fourche.....	\$116,234		\$51,390	\$51,192	\$218,816
Boise.....		\$8,980	50,875	35,000	76,895
Carlsbad.....	21,207		15,944	9,163	46,314
Huntley.....	421,755		43,631	9,865	475,251
Klamath.....	38,615		20,000	27,545	86,166
Lower Yellowstone.....	18,543		² 30,000		38,543
Minidoka.....		35,713	33,500	16,865	14,652
Newlands.....	188,437		34,132	10,792	233,361
North Platte (Interstate).....	78,164		60,000	59,711	197,875
North Dakota Pumping.....	¹ 75,340		² 20,000	611	95,951
Okanogan.....	95,468		11,304	7,092	113,864
Orland.....	42		3,200	210	3,452
Shoshone.....	33,157		10,760	15,715	59,632
Strawberry.....	18,257		62,084	1,713	82,054
Sun River (Fort Shaw).....	38,325		4,497	5,210	48,132
Umatilla:					
East Side.....	117,818		1,800	16,900	136,518
West Extension.....	(¹)	216	600		384
Yakima:					
Sunnyside.....	23,220		31,554	3,063	57,837
Tieton.....	10,404		22,131	10,834	43,369
Yuma.....	328,625		50,000	12,123	390,748
Total, public notice projects.....	1,613,647	44,909	557,402	293,604	2,419,744
RENTAL BASIS PROJECTS.					
Grand Valley.....	130,697		23,002		153,699
Milk River.....	194,511		² 62,500	7,595	264,606
North Platte (Fort Laramie).....	47,445		² 5,000		52,445
Rio Grande.....	38,689		15,000	11,941	65,630
Sun River (Greenfields).....	44,004		² 5,000	1,470	50,474
Uncompahgre.....	2,290		² 35,000		37,290
Total, rental projects.....	457,636		145,502	21,006	624,144
Total, all projects.....	2,071,283	44,909	702,904	314,610	3,043,888

¹ Prior costs and deficits transferred to construction by district contracts.

² Estimated by Denver office; others by project managers.

TABLE 2.—1920 operation and maintenance—Net costs and accruals.

Project.	Status. ¹	Net cost, 1920.	Accruals, 1920.	1920 gain.	1920 loss.	Remarks.
Belle Fourche.....	P	\$156,597	\$148,556	.....	\$8,041	Extra cost 1920 due to flood damage.
Boise.....	P	334,412	371,860	\$37,448	.....
Carlsbad.....	P	37,000	56,424	.....	666	
Grand Valley.....	R	65,644	41,622	.....	24,022	
Huntley.....	P	61,082	70,056	8,974	.....
Klamath.....	P	92,201	86,764	.....	5,437	Extra cost 1920 on account relining C Canal.
Lower Yellow.....	P	87,687	74,203	.....	13,484	Part cost transferred under district contract.
Milk River.....	R	85,053	34,532	.....	50,521	
Minidoka.....	P	127,364	200,775	73,411	.....
North Dakota Pumping.....	P	58,093	17,328	.....	40,765	
Newlands.....	P	105,383	106,403	1,020	.....
North Platte:						
Interstate.....	P	317,817	296,426	.....	21,391	
Fort Laramie.....	R	42,075	24,142	.....	17,933	
Okanogan.....	P	68,154	58,552	.....	9,602	Extra cost 1920 due to emergency pumping.
Oriand.....	P	32,550	40,334	7,784	.....
Rio Grande.....	R	235,857	210,480	.....	25,377	
Shoshone.....	P	105,493	102,816	.....	2,677	
Strawberry.....	P	54,394	55,725	1,331	.....	Extra cost 1920 due to tunnel relining.
Sun River:						
Fort Shaw.....	P	25,427	20,434	.....	4,993	
Greenfields.....	R	26,363	7,205	.....	19,158	
Umatilla:						
East Side.....	P	26,816	36,419	9,603	.....
West Extension.....	P	14,143	15,127	984	.....
Uncompahgre.....	R	155,393	151,280	.....	4,113	
Yakima:						
Sunnyside.....	P	146,574	145,534	.....	1,340	
Tieton.....	P	93,461	86,912	.....	6,549	
Yuma.....	P	373,392	301,843	.....	71,549	Extra cost 1920 due to flood damage.
Totals.....		2,948,815	2,761,752	140,555	327,618	

¹ P indicates public notice issued; R indicates rental basis.

TABLE 3.—Comparison between operation and maintenance estimates and results, Jan. 1 to Feb. 28, 1921.

Project.	Gross cost.				Accruals.				Area that can be irrigated 1921.
	Estimate for 1921.		Actual cost to Feb. 28.	Amount, *over or under.	Estimate for 1921.		Actual return to Feb. 28.	Amount, more or *less.	
	Total for year.	To Feb. 28.			Total for year.	To Feb. 18.			
									Acres.
Belle Fourche ¹	\$120,000				\$148,000				82,800
Boise.....	335,000	\$43,000	\$37,000	\$6,000	311,500	0	0	0	165,800
Carlsbad.....	50,000	12,100	12,300	*200	67,000	0	\$1,200	\$1,200	25,000
Grand Valley.....	60,000	10,700	10,400	300	61,400	0	0	0	38,350
Huntley.....	75,000	8,700	10,200	*1,500	88,600	0	0	0	31,300
Klamath.....	75,000	5,700	2,000	3,700	87,900	0	0	0	52,500
Lower Yellowstone.....	66,000	6,000	5,000	1,000	65,000	0	0	0	38,700
Milk River.....	90,000	2,200	3,200	*1,000	56,000	0	0	0	274,500
Minidoka.....	134,000	12,500	10,700	1,800	134,000	0	0	0	49,000
Newlands.....	118,700	36,500	35,000	1,500	120,600	0	0	0	69,300
North Dakota Pumping ¹	58,600				26,800				7,650
North Platte—									
Interstate.....	275,000	33,000	26,000	7,000	342,800	\$3,000	3,000	0	*129,800
Fort Laramie.....	63,000	5,300	4,700	600	24,000	1,800	1,800	0	14,000
Okanogan.....	35,000	4,000	3,800	200	41,700	0	0	0	8,000
Orland.....	35,000	4,700	5,200	*500	41,200	0	0	0	20,500
Rio Grande ¹	242,500				249,000				118,000
Shoshone.....	108,600	10,200	8,500	1,700	126,000	0	0	0	65,800
Strawberry Valley ¹	87,500				60,300				59,100
Sun River:									
Fort Shaw.....	20,000	2,400	1,900	500	26,400	0	0	0	12,200
Greenfields.....	25,000	2,000	2,700	*700	10,000	0	0	0	25,100
Umatilla.....	53,000	6,400	6,800	*400	49,300	0	0	0	26,300
Uncompahgre.....	145,000	24,000	24,000	0	152,300	3,000	3,000	0	100,000
Yakama:									
Sunnyside.....	135,000	26,600	24,400	2,200	150,500	0	0	0	110,800
Tieton.....	92,000	11,400	13,300	*1,900	103,200	0	0	0	32,000
Yuma.....	233,000	29,000	29,000	0	300,000	13,500	21,000	7,500	61,300
Total.....	4 2,731,900	296,400	276,100	20,300	2,843,500	21,300	30,000	8,700	1,417,900

¹ Report not received from project in time for publication.² Stored water is furnished through St. Mary Canal for 21,600 acres additional.³ Includes 17,000 acres for which water is carried in main canal.⁴ Total estimated net cost is \$2,652,118.

WATER CHARGES, RIO GRANDE PROJECT.¹

Thorough Analysis by H. H. Brook, President Elephant Butte Irrigation District.

THIS article is written to give the actual, plain truth about water charges without favor or prejudice. The figures in Tables 1 and 2 are taken from the actual water cards, which show the number of acres each farmer contracted for and the actual acre-feet charged, from which his bill was computed on December 31 for the year 1920. We defy anyone to disprove these figures or show wherein they do not represent the true condition. This is not a defense of the United States Reclamation Service, but merely an effort to arrive at the truth. These costs could be lowered, especially by the district management, but we leave it to you if the cold facts show the costs to be generally excessive or exorbitant compared—

(1) With any other section of the Southwestern country, or (2) considering the condition of our ditches, or (3) even in comparison with the "good old days" of the community ditches.

The use of water in the Rincon Valley was only 2.3 acre-feet per acre, and there have been few complaints; consequently the Mesilla Valley is given most attention. The administration charges of the Elephant Butte District are the only irrigation charges left out of the table, and this was necessarily done because they vary according to amount previously paid to the water users' association. They ran from 3 to 20 cents per acre in 1919 and from 11½ to 23 cents per acre in 1920. These charges are not substantially different from what they have always been and are only indirectly a part of the water charge. Actual cost of district by years shows that administration was 30 per cent less in 1919 than in 1914, 1915, and 1916.

¹ Reprinted in part from an article by President Brook in *Organized Farming*.

ANALYSIS OF TABLE 1.

1. Twelve thousand two hundred and eighty acres, or more than one-fourth of the land irrigated, used less than 2 acre-feet of water and paid only \$2 per acre, including storage.

2. Thirty-one thousand six hundred and thirty-eight acres, or two-thirds of the valley, averaged less than 3 acre-feet of water and paid a total average of \$2.49 per acre or less, including storage.

3. Forty thousand nine hundred and forty-five acres out of 47,783 acres, or 85 per cent of the whole valley, used less than 4 acre-feet and paid an average total cost of \$3.51 or less, including storage.

4. More acres used less than 1 acre-foot than used over 5 feet.

5. Twelve thousand two hundred and eighty acres used less than 2 acre-feet, as against 6,838 acres using 4 feet or more.

6. The table can be summarized as follows:

25.7 per cent paid a total of \$2 per acre.

40.7 per cent paid from \$2 to \$3 per acre.

19.4 per cent paid from \$3 to \$4.25 per acre.

10.5 per cent paid from \$4.25 to \$5.50 per acre.

3.8 per cent paid \$5.50 up.

Average for whole Mesilla Valley, per acre----- \$2.78
Less 5 per cent discount----- .14

Average total, Mesilla Valley----- 2.64

All of the above includes storage and is subject to 5 per cent discount for payment on time.

REASONS FOR HIGH CHARGES.

There are four reasons to account for the 6,838 acres that used over 4 feet and also for a good deal of the land that used between 3 and 4 feet.

TABLE 1.—*Mesilla Valley water deliveries and costs.*

[Compiled from actual water cards and bills for the year Jan. 1, 1920, to Jan. 1, 1921.]

Acre-feet—rate of use.	Acres.	Per cent.	Cumulative per cent.	Total acre-feet.	Average use per acre.	Average charge made by U. S. Reclamation Service for water per acre.	Net cost of water less credit of 25 cents by House bill No. 11.	Plus the storage charge.	Total cost of water per acre according to use.
0 to 1.....	1,893	3.9	.....	1,595	.....	\$1.75	\$1.50	\$0.50	\$2.00
1 to 2.....	10,387	21.8	25.7	16,914	.....	1.75	1.50	.50	2.00
2 to 3.....	19,358	40.6	66.3	48,242	2.49	2.24	1.99	.50	2.49
3 to 4.....	9,307	19.4	85.7	31,805	3.41	3.26	3.01	.50	3.51
4 to 5.....	5,021	10.5	96.2	22,379	4.45	4.56	4.31	.50	4.81
5 and up.....	1,817	3.8	100	11,950	6.57	7.21	6.96	.50	7.46
Totals and average, whole valley.....	47,783	100	.....	132,885	2.78	2.53	2.28	.50	2.78

² NOTE.—A total of 97 acres within the city limits of Las Cruces, paying flat rate of \$4 per acre, not included in above. A total of 378 acres formerly reported on community laterals has been prorated and reported under proper headings included in above.

1. Land was on a long lateral. (This will be partially remedied next year by an allowance.)

2. Land farmed by shiftless tenants or employees who wasted water into sloughs or shut off water during the night without reporting it.

3. Acreage undersigned. (The United States Reclamation Service claim this accounts for most of high water bills. Cases have been found where 10 acres were signed and 40 watered, which nefarious scheme exacts its own penalty.)

4. Inaccuracy and mistakes in measuring water.

The district board has thrashed out this last reason thoroughly with the Reclamation Service and plans are to be put into effect next season that will improve the accuracy of water measurements.

Only two of these reasons have any right to consideration, the first and fourth.

Land on a long lateral does not get what it pays for. This was realized and the opinion of the public was asked on this in a questionnaire in October last, and while there was some difference of opinion the majority was in favor of an allowance which has been arranged for next year.

INACCURACY IN WATER MEASUREMENTS CAUSE MOST MOST COMPLAINTS.

The fourth reason, or inaccuracy in measurements, has caused most of the complaints. The farmers have lost faith in the measurements and we believe rightly so.

The point to bear in mind here, however, is that because mistakes have been made in measurements THE SYSTEM IS NOT WRONG. Practically every farmer who was fairly and legitimately charged a high bill (for reasons 3 and 4) is taking advantage of this argument of inaccuracy in measurements to knock the system of water measurement.

In no instance where farmers have checked the Reclamation measurements has there been a com-

plaint. Several farmers are known to have measured their water and in every case they say the service was very liberal.

WARNING.

The farmer who is living on his land and farming it properly and paying a fairly average water bill must be on his guard against being stampeded or talked into a proposition that will make him pay for the carelessness and waste of the shiftless farmer, the careless renter, or the dishonest men who undersign their acreage.

SECURE ACCURATE INFORMATION.

Very few farmers are correctly or thoroughly informed about irrigation affairs. There is a monstrous amount of misinformation floating around. Be careful of your facts. Don't take anything on hearsay.

Hearsay should be given no consideration at all. It is easy to make loose statements, but the same man will seldom put his statements in writing.

EVEN HIGH CHARGES HAVE THEIR BENEFITS.

Assuming the water is measured correctly, and this will be insisted upon by the district, those high charges of over 4 feet are not without their benefits to the project as a whole.

1. It is a quicker and more effective means of bringing about better farming methods than all the bulletins, schools, and colleges put together.

2. It is about the only way to eliminate small, inadequate, wasteful laterals and farm ditches. Many farmers will fool along for years wasting their time and the time of their men with a pitiful head of water, half of which seeps to the water table before the end of the field is reached. The cost of the labor wasted is more than the cost of the water wasted,

TABLE 2.—*Rincon Valley—Actual water sold, 1920.*

Acre-feet.	Acres.	Per cent.	Cumulative per cent.	Acre-feet.	Average acre-feet.	U. S. Reclamation Service cost.	Cost less 25 per cent credit.	Plus storage.	Total cost per acre.
0 to 2.....	2,411	35.2	.....	3,314	.....	\$1.75	\$1.50	\$0.50	\$2.00
2 to 3.....	2,683	40.3	76.5	6,420	2.40	2.15	1.90	.50	2.40
3 to 4.....	1,280	19.2	95.7	4,313	3.36	3.20	2.95	.50	3.45
4 to 5.....	249	3.7	99.4	1,082	4.35	4.43	4.18	.50	4.68
Above 5 feet.....	39	0.6	100	215	5.51	5.89	5.64	.50	6.14
Totals.....	6,662	100	.....	15,344	.....	.....	.....	.....	.....

Average use, whole Rincon Valley, 2.30 acre-feet.

Average cost, whole Rincon Valley, including storage, \$2.30 per acre.

Notes on Rincon water table.

1. Thirty-six and two-tenths per cent, or over one-third of the Rincon Valley, paid \$2 per acre total charge, including storage.

2. Over three-fourths of the valley paid an average of \$2.40 or less per acre.

3. Only 6.3 per cent, or 288 acres, used over 4 feet.

but it is never noticed until a high water bill forces the realization of the folly.

3. The same reasoning holds for better leveling and preparation of land. It is true that many of our farmers haven't money to level their land, but a little can be done every winter. It is equally true that lots more land could be leveled, but will not be until there is a sharp-pointed reason. Further, it is perfectly fair that the man who hasn't spent any money preparing his land should pay a higher total charge (not higher rate) than the man who has invested heavily in leveling.

4. High charges for over 4 acre-feet will compel a better duty of water. The average farmer will say: "What do I care about the duty of water?" It is to his interest to care. A high use or duty means less acres in the whole project, and consequently a higher construction cost to every farmer. It might be said that the whole question of the High Line Canal was decided by the duty of water. After days of argument the duty was set at 3 acre-feet at the farm for the Elephant Butte district. From this basis, after bringing in all the related factors, it was decided that there was not sufficient water to justify bringing any new acres under irrigation, thus throwing the cost of the High Line Canal upon the power development, which, of course, could not stand the burden.

5. Seepage of the land is not now such an important reason as it was, but it is still very important, in many places.

6. The use of more than enough water to moisten the soil to the depth of the root system of the plants grown carries off fertility as well as alkali. The chemical elements needed and used by any plant must be in a soluble state. It is clear that water percolating through the soil to the water table and there to the drain canal will carry off the soluble plant food just as readily as the soluble alkali salts. In other words, a high charge for excessive use of water tends to protect the farmer against himself.

This will not be the only project that will have been brought to better farming by high charges for excessive use. It is generally known that as the project develops the use of water decreases for two principal reasons: (1) It is found that better crops can be raised with less water. (2) The demand for water from new acres forces an economical use. This sounds cold-blooded, but in reality it is not, because the farmer in the end is better off by the improved methods forced upon him and the enlargement of the project.

Please change my address on the RECORD. It is too valuable a paper to even miss one copy.—*J. C. McAuley, Blair, Nebr.*

The Reclamation Record.

Issued monthly by the Reclamation Service, Department of the Interior, under the authority of the Secretary of the Interior.

Copies of the RECLAMATION RECORD will be sent free of charge to any water user on our reclamation projects. The subscription price to others is 75 cents a year, payable in advance. Subscriptions may be forwarded to the chief clerk, United States Reclamation Service, Washington, D. C., and remittances (postal money order or New York draft) should be made payable to the special fiscal agent, United States Reclamation Service. Postage stamps will not be accepted.

Material for publication in the RECLAMATION RECORD should be addressed to *Editor*, United States Reclamation Service, Washington, D. C., and should be mailed in time to reach the editor not later than the 14th of the month, in order to insure publication in the succeeding month's issue of the RECORD.

HUGH A. BROWN, EDITOR.

SUBSCRIPTION BLANK.

Reclamation Record.

[To be used only by persons who are NOT water users on the projects of the U. S. Reclamation Service.]

_____, 1921.

CHIEF CLERK,

*U. S. Reclamation Service,
Washington, D. C.*

DEAR SIR: I am NOT a water user on one of the projects of the U. S. Reclamation Service, but wish to receive the RECLAMATION RECORD each month.

I inclose herewith 75 cents for a year's subscription beginning with the current issue.

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A sober national thought with regard to the importance, the absolute necessity, of a sustained agriculture in this country is imperative.



Ramshorn Ditch Co. v. United States.

THE above-named suit was brought by the United States against the Ramshorn Ditch Co. to determine the right of the Government to utilize certain seepage waters on the North Platte Federal irrigation project in Nebraska. The trial court found in favor of the United States (254 Fed., 842), and the decree of that court has been affirmed by the Circuit Court of Appeals (269 Fed., 80). The following is the syllabus of the opinion of the appellate court:

An appropriator of waters for irrigation is entitled to save, and use for the beneficial irrigation of the lands under its canal, water which had escaped therefrom by seepage, independent of the legislation of the State in relation to seepage waters.

Where an appropriator of water permits a portion thereof, which had seeped from its canal, to return to and mingle with the waters of a river from which it had been taken, such returned waters are to be considered part of the water of the river, as though never diverted therefrom, and inures to the benefit of the appropriators on the river in the order of their appropriations.

Seepage and waste water allowed to return to its natural channel, with no intention by the appropriator to recapture it, is abandoned; but the intention to abandon is essential, and it must be determined as a question of fact from the evidence in each particular case.

An appropriator who has abandoned his rights to water may at any time resume possession and exercise all such rights if no new rights have intervened.

The Nebraska Board of Irrigation, Highways, and Drainage had no authority to transfer an appropriation from a natural stream to a channel deriving its waters from seepage from another canal and to give the appropriation of such seepage waters the priority of the old appropriation from the natural stream.

Appropriated water is not deemed abandoned as soon as it seeps from the canal in which it is being conveyed; but the appropriator must be allowed a reasonable time in which to save and use water escaping by seepage and waste from his canal or ditch.

Rev. Stats. Nebr., 1913, sec. 3426, authorizing the owner of an irrigation canal to collect seepage water thereunder to apply to the irrigation of land covered by the original appropriation of such canal, gives the right to the use of such water without formal appropriation proceedings, since the objects of the State laws regulating proceedings for appropriation to pro-

vide water for as many owners of land as possible, and to decide priority between the different claimants, do not apply to the use of seepage water by the original appropriators.

Even if the seepage waters flowing in the channel not the original and natural stream are public waters, subject to appropriation under Rev. Stats. Nebr. 1913, sec. 3427, an appropriation of such waters by a former appropriator from the natural stream can not be given the date of the original appropriation from the stream, so as to take priority over a diversion of the water by the appropriator from whose canal it had escaped, which diversion was made before the change of appropriation.

Where the original application by the United States for appropriation of water stated an intention to irrigate all the lands shown on the accompanying plats, and to irrigate all lands on the north side of the river, supplementing those with an adequate supply, and furnishing full rate to all others, an approval of the application as one for the irrigation of lands described therein, not covered by prior existing rights, did not exclude lands under the other existing canals intended to be covered by the new project, so that the United States could reclaim seepage waters from its canals to irrigate such lands with the provisions of Rev. Stats. Nebr. 1913, sec. 3426.

Under the Warren Act of February 21, 1911 (36 Stat. 925), and Laws, Nebr. 1911, c. 151, passed in aid thereof, a contract between the United States and a land company for the delivery to the latter of water which escaped by seepage from the canal of a reclamation project was a valid contract, which gave the United States the right to conserve and deliver water thereunder.

In view of the reclamation act of June 17, 1902 (32 Stat. 388), the Warren Act of February 21, 1911 (36 Stat. 925), and the legislation of Wyoming and Nebraska, an appropriation by the United States Reclamation Service for the irrigation of lands in Nebraska is valid, though the source of the supply is in Wyoming.

The United States suffers injury, entitling it to an injunction, by the prevention of delivery of water which seeped from its irrigation canal to a corporation with whom it had a contract to deliver the water at a substantial price.

Payette-Boise Water Users' Association (Ltd.) v. Bond et al.

The above-named suit was brought to contest the right of the Secretary of the Interior to fix a construction charge of \$80 per irrigable acre on the

Boise Federal irrigation project in Idaho. An interlocutory opinion was filed July 21, 1919 (263 Fed. 734). A second opinion was filed September 18, 1920 (269 Fed. 159). The following is the syllabus to the last-named opinion:

While administrative expenses of the Reclamation Service, such as salaries of the administrative officers and of those who assisted them in the performance of administrative duties, are not chargeable as part of the cost of a project, the cost of services rendered to that particular project, such as the keeping of its accounts, preparation of engineering specifications, or purchasing and forwarding supplies, whether such services are rendered at the place of the project or elsewhere, or for such project alone or in connection with others, in such case prorated, is properly chargeable as a part of its cost.

The amount of the claim of a contractor on an irrigation project, which is being contested by the Government in the Court of Claims, can not properly be charged to the settlers as a part of the cost of the project.

In computing the acreage on which the cost of an irrigation project was to be charged, a general deduction from the lands within the limits of the project of 10,000 acres, because it was "estimated" that such quantity would prove incapable of irrigation, because rough or sandy or from seepage, *held* not justified, where no land was described and excluded, and all lands within the project were equally entitled to water if demanded, and where specific tracts had already been excluded as nonirrigable.

Settlers on lands within an irrigation project, with the understanding that water shall be supplied to their lands and that the cost of the works will be assessed against them, are not concluded by the decision of the Secretary of the Interior as to what their interest in the works shall be, nor as to what sum shall be assessed against their lands for cost of construction, but have rights which may be judicially determined.

Lands Subject to the Oil Leasing Act.

Tracts of land purchased by the United States because the same were subject to damage on account of seepage from the Nelson Reservoir of the Milk River Federal irrigation project, in Montana, are lands "owned by the United States" within the meaning of section 1 of the oil leasing act of February 25, 1920 (41 Stat. 437), and the department may issue a prospecting permit therefor under said act, subject to such terms and conditions as will protect the interests of the Government and subserve the purpose for which the tracts were purchased. (Departmental decision, Feb. 28, 1921.)

Special Provisions of the Appropriation Act for the Department of Agriculture.

[Extracts from] An Act Making appropriations for the Department of Agriculture for the fiscal year ending June 30, 1922. (Act. Mar. 3, 1921, Pub. No. 367, 41 Stat. —.)

General expenses, Bureau of Plant Industry.—* * * For investigations in connection with western irriga-

tion agriculture, the utilization of lands reclaimed under the reclamation act, and other areas in the arid and semiarid regions, \$94,420: *Provided*, That of this sum \$11,000 shall be immediately available.

General expenses, Bureau of Soils.—* * * For examination of soils to aid in the classification of agricultural lands, in cooperation with other bureaus of the department and other departments of the Government, \$15,000.

General expenses, Bureau of Public Roads.—* * * For investigating and reporting upon the utilization of water in farm irrigation, including the best methods to apply in practice; the different kinds of power and appliances and the development of equipment for farm irrigation; the flow of water in ditches, pipes, and other conduits; the duty, apportionment, and measurement of irrigation water; the customs, regulations, and laws affecting irrigation; for the purchase and installation of equipment for experimental purposes; for the giving of expert advice and assistance; for the preparation and illustration of reports and bulletins on irrigation; for the employment of assistants and labor in the city of Washington and elsewhere; for rent outside of the District of Columbia; and for supplies and all necessary expenses, \$72,000.

For investigating and reporting upon farm drainage and upon the drainage of swamp and other wet lands which may be made available for agricultural purposes; for preparing plans for the removal of surplus water by drainage, and for giving expert assistance by advice or otherwise in the drainage of such lands; for conducting field experiments and investigations concerning the construction and maintenance of farm-drainage work; for investigating and developing equipment intended for the construction and maintenance of farm-drainage structures; for the purchase of materials and equipment; and for preparing and illustrating reports and bulletins on drainage; and for the employment of assistants and labor in the city of Washington and elsewhere; for rent outside of the District of Columbia; and for supplies and all necessary expenses, \$73,760.

Demonstrations on reclamation projects.—To enable the Secretary of Agriculture to encourage and aid in the agricultural development of the Government reclamation projects; to assist, through demonstrations, advice, and in other ways, settlers on the projects; and for the employment of persons and means necessary in the city of Washington and elsewhere, \$30,000.

Homestead Rights of Settlers Who Intermarry.

An Act For the relief of bona fide settlers who intermarry after having complied with the homestead law for one year. (Act Mar. 1, 1921, Public No. 339, 41 Stat. —.)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the act entitled "An act providing that the marriage of a homestead entryman to a homestead entrywoman shall not impair the right of either to a patent, after compliance with the law a year, to apply to existing entries," approved April 6, 1914 (Thirty-eighth Statutes, page 312), be, and the same is hereby, amended by adding thereto the following: "*Provided further*, That in the administration of this act the terms 'entryman' and 'entrywoman' shall be con-

strued to include bona fide settlers who have complied with the homestead law for at least one year next preceding such marriage."

Rights of Way on the Public Domain.

An Act To amend acts to permit the use of the right of way through the public lands for tramroads, canals, and reservoirs, and for other purposes. (Act Mar. 1, 1921, Public No. 342, 41 Stat., —.)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That in addition to the rights of way granted by sections 18, 19, 20, and 21 of the act of Congress entitled "An act to repeal timber-culture laws, and for other purposes, approved March 3, 1891 (Twenty-sixth Statutes, page 1095), as amended by the act of Congress entitled "An act to amend the irrigation act of March 3, 1891 (Twenty-sixth Statutes, page 1095, section 18), and to amend section 2 of the act of May 11, 1898 (Thirtieth Statutes, page 404)," approved March 4, 1917 (Thirty-ninth Statutes, page 1197), and, subject to the conditions and restrictions therein contained, the Secretary of the Interior is authorized to grant permits or easements for not to exceed five acres of ground adjoining the right of way at each of the locations, to be determined by the Secretary of the Interior; to be used for the erection thereon of dwellings or other buildings or corrals for the convenience of those engaged in the care and management of the works provided for by said acts: *Provided*, That this act shall not apply to lands within national forests.

Final Proof by Ex-Service Entrymen.

An Act To authorize certain homestead settlers or entrymen who entered the military or naval service of the United States during the war with Germany to make final proof of their entries. (Act Mar. 1, 1921, Public No. 351, 41 Stat., —.)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That any settler or entryman under the homestead laws of the United States, who, after settlement, application, or entry and prior to November 11, 1918, enlisted or was actually engaged in the United States Army, Navy, or Marine Corps during the war with Germany, who has been honorably discharged and because of physical incapacities due to service is unable to return to the land, may make proof, without further residence, improvement, or cultivation, at such time and place as may be authorized by the Secretary of the Interior, and receive patent to the land by him so entered or settled upon: *Provided*, That no such patent shall issue prior to the survey of the land.

Additional Compensation for Government Employees.

[Extract from] An Act Making appropriations for the legislative, executive, and judicial expenses of the Government for the fiscal year ending June 30, 1922, and for other purposes. (Act Mar. 3, 1921, Public No. 364, 41 Stat., —.)

SEC. 6. That all civilian employees of the Governments of the United States and the District of Columbia who receive a total of compensation at the rate of \$2,500 per annum or less, except as otherwise

provided in this section, shall receive, during the fiscal year ending June 30, 1922, additional compensation at the rate of \$240 per annum: *Provided*, That such employees as receive a total of annual compensation at a rate more than \$500 and less than \$2,740 shall receive additional compensation at such rate per annum as may be necessary to make their salaries, plus their additional compensation, at the rate of \$2,740 per annum, and no employee shall receive additional compensation under this section at a rate which is more than 60 per centum of the rate of the total annual compensation received by such employee: *Provided further*, That the increased compensation at the rate of \$240 per annum for the fiscal year ending June 30, 1921, shall not be computed as salary in construing this section: *Provided further*, That where an employee in the service on June 30, 1920, has received during the fiscal year 1921, or shall receive during the fiscal year 1922, an increase of salary at a rate in excess of \$200 per annum, or where an employee whether previously in the service or not, has entered the service since June 30, 1920, whether such employee has received an increase in salary or not, such employees shall be granted the increased compensation provided herein only when and upon the certification of the person in the legislative branch or the head of the department or establishment employing such persons of the ability and qualifications personal to such employees as would justify such increased compensation.

The provisions of this section shall not apply to the following: Employees paid from the postal revenues and sums which may be advanced from the Treasury to meet deficiencies in the postal revenues; employees whose pay is adjustable from time to time through wage boards or similar authority to accord with the commercial rates paid locally for the same class of service; employees of the Panama Canal on the Canal Zone; employees of the Alaskan Engineering Commission in Alaska; employees paid from lump-sum appropriations in bureaus, divisions, commissions, or any other governmental agencies or employments created by law since January 1, 1916, except employees of the United States Tariff Commission and the Bureau of War Risk Insurance, who shall be included, and officers and members of the Metropolitan police of the District of Columbia and the United States park police who receive the compensation fixed by the act approved December 5, 1919, and officers and members of the fire department of the District of Columbia who receive the compensation fixed by the act approved January 24, 1920, shall receive increased compensation at the rate allowed by this section for other employees. The provisions of this section shall not apply to employees whose duties require only a portion of their time, except charwomen, who shall be included; employees whose services are utilized for brief periods at intervals; persons employed by or through corporations, firms, or individuals acting for or on behalf of or as agents of the United States or any department or independent establishment of the Government of the United States in connection with construction work or the operation of plants; employees who receive a part of their pay from any outside sources under cooperative arrangements with the Government of the United States or the District of Columbia; employees who serve voluntarily or receive only a nominal compensation, and employees who may be provided with special allowances because of their service in foreign countries. The provisions of this section shall not

apply to employees of the railroads, express companies, telegraph, telephone, marine cable, or radio system or systems taken over by the United States, and nothing contained herein shall be deemed a recognition of the employees of such railroads, express companies, telegraph, telephone, marine cable, or radio system or systems as employees of the United States.

Section 6 of the legislative, executive, and judicial appropriation act approved May 10, 1916, as amended by the naval appropriation act approved August 29, 1916, shall not operate to prevent anyone from receiving the additional compensation provided in this section who otherwise is entitled to receive the same.

Such employees as are engaged on piecework, by the hour, or at per diem rates, if otherwise entitled to receive the additional compensation, shall receive the same at the rate to which they are entitled in this section when their fixed rate of pay for the regular working hours and on the basis of three hundred and thirteen days in the said fiscal year would amount to \$2,500 or less: *Provided*, That this method of computation shall not apply to any per diem employees regularly paid a per diem for every day in the year.

So much as may be necessary to pay the additional compensation provided in this section to employees of the Government of the United States is appropriated out of any money in the Treasury not otherwise appropriated.

So much as may be necessary to pay the increased compensation provided in this section to employees of the government of the District of Columbia is appropriated, 40 per centum out of any money in the Treasury not otherwise appropriated and 60 per centum out of the revenues of the District of Columbia, except to employees of the Washington Aqueduct and the water department, which shall be paid entirely from the revenues of the water department, and to employees of the Minimum Wage Board, the community center department, and the playgrounds department, which shall be paid wholly out of the revenue of the District of Columbia.

So much as may be necessary to pay the increased compensation provided in this section to persons employed under trust funds who may be construed to be employees of the Government of the United States or of the District of Columbia is authorized to be paid, respectively, from such trust funds.

Reports shall be submitted to Congress on the first day of the next regular session showing for the first four months of the fiscal year the average number of employees in each department, bureau, office, or establishment receiving the increased compensation at the rate of \$240 per annum and the average number by grades receiving the same at each other rate.

* * * * *

Appropriations for Reclamation Service.

[Extract from] An Act Making appropriations for the sundry civil expenses of the Government for the fiscal year ending June 30, 1922, and for other purposes. (Act Mar. 4, 1921, Public No. 389, 41 Stat. —.)

* * * * *

RECLAMATION SERVICE.

The following sums are appropriated out of the special fund in the Treasury of the United States created by the act of June 17, 1902, and therein design-

ated "the reclamation fund," to be available immediately:

For all expenditures authorized by the act of June 17, 1902 (Thirty-second Statutes, page 388), and acts amendatory thereof or supplementary thereto, known as the reclamation law, and all other acts under which expenditures from said fund are authorized, including salaries in the District of Columbia and elsewhere; examination of estimates for appropriations in the field; refunds for overcollections hereafter received on account of water-right charges, rentals, and deposits for other purposes; printing and binding; law books, books of reference, periodicals, engineering and statistical publications, not exceeding \$1,500; purchase, maintenance, and operation of horse-drawn or motor-propelled passenger-carrying vehicles; payment of damages caused to the owners of lands or private property of any kind by reason of the operations of the United States, its officers or employees, in the survey, construction, operation, or maintenance of irrigation works, and which may be compromised by agreement between the claimant and the Secretary of the Interior; and payment for official telephone service in the field hereafter incurred in case of official telephones installed in private houses when authorized under regulations established by the Secretary of the Interior:

Salt River project, Arizona: For examination of project and project accounts, \$1,000;

Yuma project, Arizona-California: For operation and maintenance, continuation of construction, and incidental operations, \$415,000;

Orland project, California: For operation and maintenance, continuation of construction, and incidental operations, \$118,000;

Grand Valley project, Colorado: For operation and maintenance, continuation of construction, and incidental operations, \$377,000;

Uncompahgre project, Colorado: For operation and maintenance, continuation of construction, and incidental operations, \$214,000;

Boise project, Idaho: For operation and maintenance, continuation of construction, and incidental operations, \$1,570,000, together with the unexpended balance of the appropriation for this project for the fiscal year 1921;

King Hill project, Idaho: For operation and maintenance, continuation of construction, and incidental operations, \$300,000;

Minidoka project, Idaho: For operation and maintenance, continuation of construction, and incidental operations, with authority in connection with the construction of American Falls Reservoir, to purchase or condemn and to improve suitable land for a new town site to replace the portion of the town of American Falls which will be flooded by the reservoir, and to provide for the removal of buildings to such new site and to plat and to provide for appraisal of lots in such new town site and to exchange and convey such lots in full or part payment for property to be flooded by the reservoir and to sell for not less than the appraised valuation any lots not used for such exchange, \$1,735,000, together with the unexpended balance of the appropriation for this project for the fiscal year 1921;

Huntley project, Montana: For operation and maintenance, continuation of construction, and incidental operations, \$198,000;

Milk River project, Montana: For operation and maintenance, continuation of construction, and incidental operations, \$1,017,000;

Sun River project, Montana: For operation and maintenance, continuation of construction, and incidental operations, \$687,000;

Lower Yellowstone project, Montana-North Dakota: For operation and maintenance, continuation of construction, and incidental operations, \$340,000;

North Platte project, Nebraska-Wyoming: For operation and maintenance, continuation of construction, and incidental operations, \$2,115,000;

Newlands project, Nevada: For operation and maintenance, continuation of construction, and incidental operations, \$1,488,000;

Carlsbad project, New Mexico: For operation and maintenance, continuation of construction, and incidental operations, \$100,000;

Rio Grande project, New Mexico-Texas: For operation and maintenance, continuation of construction, and incidental operations, \$1,900,000;

North Dakota pumping project, North Dakota: For operation and maintenance, continuation of construction, and incidental operations, \$115,000;

Deschutes project, Oregon: For beginning construction and incidental operations, \$400,000;

Umatilla project, Oregon: For operation and maintenance, continuation of construction, and incidental operations, \$467,000;

Klamath project, Oregon-California: For operation and maintenance, continuation of construction, and incidental operations, \$1,213,000;

Belle Fourche project, South Dakota: For operation and maintenance, continuation of construction, and incidental operations, \$485,000;

Strawberry Valley project, Utah: For operation and maintenance, continuation of construction, and incidental operations, \$144,000;

Okanogan project, Washington: For operation and maintenance, continuation of construction, and incidental operations, \$33,000, together with the unexpended balance of the appropriation for this project for the fiscal year 1921;

Yakima project, Washington: For operation and maintenance, continuation of construction, and incidental operations, \$2,100,000;

Riverton project, Wyoming: For operation and maintenance, continuation of construction, and incidental operations, \$850,000: *Provided*, That when any land on the project is opened to homestead entry under the terms of the "reclamation law," the entryman shall pay to the United States for the lands the sum of \$1.50 per acre as provided in section 2 of the act approved March 3, 1905 (volume 33, Statutes at Large, page 1016), to be credited to the fund established by said act of 1905, together with the proceeds from the sale of town sites established in said project under the "reclamation law";

Shoshone project, Wyoming: For operation and maintenance, continuation of construction, and incidental operations, \$1,784,000;

Secondary projects: For cooperative and other miscellaneous investigations, \$100,000;

Under the provisions of this act no greater sum shall be expended, nor shall the United States be obligated to expend, during the fiscal year 1922, on any reclamation project appropriated for herein an amount in excess of the sum herein appropriated therefor, nor shall the whole expenditures or obligations incurred for all of such projects for the fiscal year 1922 exceed the whole amount in the "reclamation fund" for that fiscal year;

Ten per centum of the foregoing amounts shall be available interchangeably for expenditures on the

reclamation projects named; but not more than 10 per centum shall be added to the amount appropriated for any one of said projects;

Whenever, during the fiscal year ending June 30, 1922, the Director of the Reclamation Service shall find that the expenses of travel can be reduced thereby, he may, in lieu of actual traveling expenses, under such regulations as he may prescribe, authorize the payment of not to exceed 3 cents per mile for a motor cycle or 7 cents per mile for an automobile, used for necessary travel on official business;

All moneys hereafter received from any State, municipality, corporation, association, firm, district, or individual for investigations, surveys, construction work, or any other development work incident thereto involving operations similar to those provided for by the reclamation law shall be covered into the reclamation fund and shall be available for expenditure for the purposes for which contributed in like manner as if said sums had been specifically appropriated for said purposes;

In all, for the Reclamation Service, \$20,277,000.

For reimbursement to the reclamation fund the proportionate expense of operation and maintenance of the reservoirs for furnishing stored water to the lands in Yakima Indian Reservation, Washington, in accordance with the provisions of section 22 of the act of August 1, 1914 (Thirty-eighth Statutes, page 604), there is appropriated, out of any money in the Treasury not otherwise appropriated, \$11,000.

* * * * *

Date of Termination of World War.

Public resolution No. 64, approved March 3, 1921, provides, subject to certain enumerated exceptions, as follows:

That in the interpretation of any provision relating to the duration or date of the termination of the present war or of the present or existing emergency, meaning thereby the war between the Imperial German Government and the Imperial and Royal Austro-Hungarian Government and the Government and people of the United States, in any acts of Congress, joint resolutions, or proclamations of the President containing provisions contingent upon the duration or the date of the termination of such war or of such present or existing emergency, the date when this resolution becomes effective shall be construed and treated as the date of the termination of the war or of the present or existing emergency, notwithstanding any provision in any act of Congress or joint resolution providing any other mode of determining the date of such termination. And any act of Congress, or any provision of any such act, that by its terms is in force only during the existence of a state of war, or during such state of war and a limited period of time thereafter, shall be construed and administered as if such war between the Governments and people aforesaid terminated on the date when this resolution becomes effective, any provision of such law to the contrary notwithstanding.

—Ottamar Hamele.

In an investigation made by the Bureau of Public Roads, United States Department of Agriculture, of the production of tractors in the United States during 1919, reports from 80 manufacturers show that they manufactured a total of 164,590 tractors during the year.



SUN RIVER PROJECT OFFICE AND EMPLOYEES.

Upper: Offices on second floor from flag over doorway to end of building, right.
Lower: Left to right—R. B. Williams, office engineer; Miss Margaret MacMillan, voucher clerk; H. W. Johnson, chief clerk; Miss Marian G. Valentine, special fiscal agent; Geo. O. Sanford, project manager; Miss Florence Amrhein, stenographer; H. T. Caldwell, bookkeeper; T. E. Graham, property clerk.



UMATILLA PROJECT OFFICE AND EMPLOYEES.

Left to right—C. D. Porter, janitor; H. M. Schilling, project manager; Geo. C. Patterson, chief clerk; Una H. Keck, clerk; Charles Taylor, recorder, water records; E. O. Crocker, assistant engineer; Maurice D. Scroggs, irrigation manager; Carl Voyer, storekeeper.

ENGINEERING INVESTIGATIONS.

Conveyance Losses of Water on U. S. Reclamation Service Irrigation Projects.

By E. A. Moritz, Former Project Manager, Flathead (Indian) Project Mont.

A KNOWLEDGE of conveyance losses in canals is of transcendent importance to the irrigation engineer; but notwithstanding this, it has probably received less study and investigation than less important factors bearing upon irrigation practice and engineering. The quantity of water lost in transit is enormous, and in some cases appears to equal and even exceed the quantity delivered to the lands.

Accurate information on this subject is very meager, and one is led to inquire the reason for this. The reason appears to me to be twofold: First, the inherent difficulty of the problem; and, second, the apparent high cost of securing accurate information. The element of time is also a deterrent. Much time and patience are required in handling the problem. Accurate information can not be secured from a single set of measurements made in a short space of time. Important factors that influence the results are ever present and difficult to control, and the extent of their influence may be said to be in inverse ratio to the time allotted to the work. That is to say, if the measurements or records extend over only a short space of time the effect of these factors is brought to bear in full measure, whereas if the records extend over a long period the influences tend to compensate each other and thus minimize the net effect.

Measurements of conveyance losses, usually called seepage losses, are made for two primary purposes; one being to secure statistical data, or data on which to base future designs and estimates, and the other to ascertain the extent and location of the losses in a given canal with a view to applying a remedy which will accomplish their reduction.

Measurements to secure statistical data, etc., are made relatively infrequently and usually by Government agencies only. The reason for the dearth of such measurements is that they are expensive to make and are usually of no immediate use to the observer! The net result is that when one needs such information it is not available, and when he arrives at the point where he can get it for himself he doesn't need it. The case is similar to the man who had a leaky roof. He couldn't shingle it while it was raining and when it wasn't raining he didn't need it shingled. Consequently it was never shingled. The same lack of logic is exhibited by the persons who operate irrigation works and do not make measurements of seepage losses because their system is built, and therefore they do not need the information for design; forgetting that the time may come when they may have to build another system or improve or extend their present system, and that the information will then be of great value.

When a plant is scientifically operated measurements to ascertain the extent and location of losses are not infrequently made. It obviously would be unwise to line with concrete or other expensive material a 50-mile stretch of canal when the bulk of the seepage loss occurs in a 10-mile stretch. It can not be known whether the latter is or is not the case unless and until measurements are made. Therefore the logical procedure to follow is to make measurements on such a canal at sufficiently frequent intervals to locate the bad spots and, having located them, then to apply the remedy to the affected places.

It may be argued that the seepy places can be located by visual inspection; that is, by noting when seepage or waterlogging of adjacent land is evident. But this is not true. Instances have been noted where the evidence of seepage adjacent to a canal was very marked and at other points no such evidence existed. Nevertheless tests showed that the apparently dry reaches lost more water than those that were wet. The explanation for this is simple enough. In the wet places the canal bed and banks are relatively tight and the adjacent lands do not drain readily, whereas in the dry places the bed and banks are relatively porous and the adjacent lands also, so that drainage is rapid and the water consequently disappears.

In the foregoing, measurements of seepage losses have been separated into two categories, namely, those made for statistical purposes and those made for immediate use. There are two other aspects in which seepage losses are brought before us which depend more directly upon the use to which the information is to be put: For the purposes of studying the water requirements of a project and determining the sufficiency of the water supply it is necessary to estimate what the losses in the irrigation system will be. For the purpose of designing the canals it is necessary to estimate what the seepage losses from each canal will be.

It is not so difficult to estimate the total losses from an irrigation system, although it involves more elaborate or extensive records, as it is to estimate the probable losses from canals in different materials, and the variation is not so large. Both classes of records have been kept on projects of the United States Reclamation Service. Table 1 shows the percentage of water lost on the several projects for each year from 1912 to 1918 inclusive. A considerable variation is noted on most of the projects in the percentages of water lost in the different years. Some of the variations show a rather erratic tendency at times. For example, the North Platte project shows

a loss of 66 per cent in 1915, whereas the next highest loss is only 47.2, and the average for all years is 43.6. It is difficult to believe that the loss could have been so much higher in 1915 than in any other year. The average is probably very close to the truth, but the yearly figures may or may not be. The same is true on other projects.

Variation in percentage of losses from year to year must be expected. The projects are nearly all in process of development and conditions are continually changing; new canals and laterals are built and larger quantities of water carried perhaps through longer distances. Another factor that may have considerable effect is the cleaning of silt deposits from the canals. When an extensive job of this kind is done the following season is very likely to show a considerable increase in the losses.

The large variation in the losses between projects is difficult to understand without a knowledge of the projects. The small indicated loss on the Uncompahgre project of 6.1 per cent is explained by the fact that most of the canals act as collecting channels for seepage and waste water from canals higher up. This frequently results in a net gain to the canal rather than a loss. The percentage loss includes the gains as well as the losses. The small indicated loss on the Rio Grande project results from the fact that the losses shown are for a few trunk canals only. In 1918 the losses were taken on many additional canals, hence the large increase indicated in that year. On all other projects the figures include losses in all canals and laterals.

If the Rio Grande and Uncompahgre projects are excluded, the lowest indicated loss is on the Tieton project, Washington, which shows a mean of 24.3 per cent. The highest loss is 53.2 per cent for the Carlsbad project, New Mexico. The average loss for all

the projects, exclusive of Rio Grande and Uncompahgre, is 36.1 per cent. From this it is fair to assume that 25 per cent is about the minimum loss that may safely be assumed under favorable conditions and that 50 per cent is sufficiently high for a well-planned project under unfavorable conditions.

It is commonly accepted as a fact that the seepage losses from canals decrease as time goes on and the banks become more compact and the interstices become blinded with silt. The figures given in the table do not show such a tendency. However, this does not prove the absence of such tendency generally because, as has been stated, the change in percentage of lost water from year to year is affected by new construction, variation in total quantity of water used, and maintenance work. But in some cases the absence of a tendency for canals to become tighter with continued use is clearly indicated. The Sunnyside project, Washington, is a good example. This shows a loss in 1912 of 26.7 per cent. No reduction in this figure is shown after six years continued operation. In fact, the average loss for the years 1912 to 1918, inclusive, is 0.2 per cent higher than the loss in 1912. The losses were little or not at all affected by the factors above mentioned. The Boise and Minidoka projects may be cited as other examples of a similar condition.

It has been the practice in the Reclamation Service for the past several years to have the project hydrographers make measurements of the seepage from canals in various materials to gain some idea of the actual and relative losses from canals in such materials. Precision of measurement is not aimed at, nor is it possible under the operating conditions. Rather, dependence must be placed on the multitude of measurements, thus making the error of a single measurement immaterial. In this way a fair knowledge of the

TABLE 1.—Seepage losses.

Project.	Total losses (per cent).								Predominating soils.
	1912	1913	1914	1915	1916	1917	1918	Mean.	
Salt River.....	40.0	40.0	42.7	40.0	43.3	43.7	45.9	42.2	Sandy loam and clay.
Yuma.....	34.4	32.0	27.7	20.0	27.4	25.3	23.2	27.1	Rich alluvium.
Orland.....	20.0	26.5	26.0	27.3	20.5	27.3	33.1	25.8	Sandy loam, silt, and gravelly loam.
Uncompahgre.....	4.8	5.1	7.6	12.4	2.2	2.9	7.7	6.1	Red sandy gravel, adobe, and clay loam.
Boise.....	45.5	33.9	34.8	37.1	34.8	35.8	35.1	36.7	Clay loam and light sandy loam.
Minidoka:									
North Side gravity.....	26.0	22.6	25.0	36.3	43.9	48.9	41.4	35.2	Sandy loam, clay loam, and volcanic ash.
South Side pumping.....	35.1	32.9	35.1	36.3	38.8	36.6	35.6	35.8	Do.
Huntley.....	16.2	21.6	28.6	41.3	40.3	43.9	47.5	34.9	Clay and sandy loam.
Milk River.....	42.8	32.7	40.8	61.4	38.5	41.4	35.3	41.8	Sandy loam, clay, and gumbo.
Sun River.....	20.0	38.1	39.7	41.8	41.9	37.6	40.3	37.1	Sandy loam, clay, adobe, and alluvium.
Lower Yellowstone.....	43.0	52.0	52.4	43.1	47.9	42.8	46.9	46.9	Sandy loam and gumbo.
North Platte.....	33.7	38.4	36.8	66.0	40.7	47.2	37.7	43.6	Sandy loam.
Newlands.....	39.8	36.7	29.9	41.2	29.9	32.2	38.0	35.4	Sandy loam, clay, and volcanic ash.
Carlsbad.....	48.0	54.5	55.5	48.6	58.5	57.2	50.1	53.2	Pecos sandy loam; large lime content.
Rio Grande.....	.....	6.8	2.7	5.1	6.5	3.7	14.9	6.6	Rich alluvium.
Umatilla.....	27.8	27.4	40.1	43.8	36.5	24.8	32.2	33.2	Sandy loam.
Klamath.....	36.1	39.8	40.1	50.3	49.1	41.5	40.4	42.5	Disintegrated basalt, volcanic ash.
Belle Fourche.....	31.7	40.2	43.6	31.1	15.7	31.5	32.6	32.3	Clay and sandy loam.
Okanogan.....	47.1	38.4	21.1	24.1	22.2	20.4	33.7	29.6	Volcanic ash, sand, and gravel.
Yakima, Sunnyside.....	26.7	25.8	28.4	31.2	26.2	26.8	23.4	26.9	Sandy loam and volcanic ash.
Yakima, Tieton.....	16.6	21.4	27.2	27.4	27.3	26.2	27.8	24.8	Volcanic ash.
Shoshone.....	36.4	36.5	37.2	35.1	34.9	41.8	37.7	37.1	Light sandy loam and clay loam.

actual and relative losses in different materials has been gained.

Table 2 has been prepared from these data. The materials are listed in the order of magnitude of losses in feet depth over the wetted perimeter per day. By no means all of the measurements made are included in this list, but only those that are known to be most reliable. Two hundred and seventy-seven measurements are listed covering 24 different classes of materials.

TABLE 2.—*Losses per day in canals of the U. S. Reclamation Service.*

[Depths in feet per square foot of wetted area.]

Soil.	Number of observations.	Maximum.	Minimum.	Mean.
Gravel and sand.....	2	3.62	1.44	2.53
Gravel.....	38	7.05	.22	1.70
Gravel and rock meal.....	9	2.84	.88	1.56
Sand.....	5	1.79	.81	1.27
Rock meal.....	18	1.73	.38	1.24
Sand and loose rock.....	7	.86	.62	.72
Sandy loam.....	60	3.70	.01	1.01
Loam.....	5	1.44	.84	1.07
Sand and volcanic ash.....	21	1.66	.22	.90
Gravel and volcanic ash.....	5	1.54	.38	.88
Volcanic ash.....	3	1.16	.56	.82
Brule clay.....	4	1.11	.72	.91
Clay and gravel.....	18	1.34	.16	.79
Clay and sand.....	12	1.43	.50	.76
Adobe.....	9	.93	.46	.65
Hardpan and loose rock.....	2	1.12	.24	.68
Clay and shale.....	7	1.02	.30	.59
Volcanic ash, clay, and hardpan.....	4	.77	.46	.60
Cemented gravel and sandy loam.....	2	.47	.40	.44
Caliche.....	2	.49	.38	.43
Clay.....	12	.77	.11	.34
Clay loam.....	12	1.12	.06	.30
Gumbo and sandy loam.....	11	.77	.12	.29
Concrete lining.....	9	1.07	.06	.33
All soils.....	277	1.66	.43	.87

In the application of these data we encounter the same difficulty as in determining the correct value of Kutter's n to use for designing a particular canal. In fact, the difficulty is much greater. No two persons will describe a given material in the same terms. Hence it is very difficult to select the class of material and corresponding coefficient on which to base one's judgment as to the probable losses from the canal to be built. It is, however, necessary that a selection be made, and after having determined the average class of material through which a canal is to be built a selection can be made from the coefficient in Table 2 which appears to offer the best approximation to the case in hand.

Conveyance losses, in addition to the value of the lost water, frequently constitute a serious menace to adjacent lands and frequently to lands some distance away. In the latter case drainage ditches must be built which will probably remedy the situation, but in the former drainage is likely to prove ineffective. In that case the only remedy is to stop the seepage

REMINISCENCES OF THE SUN RIVER COUNTRY.

By L. Loomis, Simms, Mont.

NOTE.—The following article was sent to us recently by Project Manager Sanford, of the Sun River project, who writes that he came across the article while looking over some of the old files in the project office. It was written on October 7, 1910, by Mr. Loomis, one of the old settlers living at the westerly end of the Fort Shaw division. We feel sure our readers will enjoy this description of some of the early irrigation experiences at Fort Shaw.—Editor.

Meeting one of the United States Reclamation Corps stationed at Fort Shaw, he said to me: "We are writing up a history of our irrigation efforts in this section, and as there are no available records, extending back, say, 40 years, we would be pleased to have you favor us with a sketch of the early-day efforts in that direction."

If the reader will bear with me I will preface my remarks by relating a little occurrence of a few days ago.

To keep a business engagement at Fort Shaw, I was on my way to that point when I reached the "Nauck Hill," west of and overlooking that portion of Sun River Valley west of Fort Shaw, comprising the Simms Creek settlement and the town of Simms, now embraced in the Fort Shaw unit of the Sun River project, United States Reclamation Service.

Being in a retrospective mood I stopped my team to let my eyes wander over the beautiful panorama spread out before them, and locate, if possible, with its changed

(Continued on page 183.)

from the canal. The two most common methods of doing this are lining with concrete and puddling with silt. Concrete lining is very expensive, and on this account should be resorted to only after all other means have failed, especially if concrete materials are not readily available. Moreover, concrete lining does not have an indefinite life and is subject to injury from various causes, principally frost and alkali action, whereas earth puddle is permanent so far as its physical stability is concerned.

Each individual case must, of course, be considered in the light of all the local controlling factors, but the point it is desired to emphasize is that concrete lining is not the best remedy for all seepage ills. It has not even been demonstrated that it reduces the losses to a minimum. Table 2 gives three classes of material, namely, clay, clay loam, and gumbo and sandy loam, that show an average loss as low as or lower than concrete lining. The permanency of concrete lining depends much upon the foundation upon which it is laid. Where the foundation is suitable and the concrete of good quality, this form of lining has in many cases given excellent satisfaction. It is well, however, in all cases to consider fully the practicability of cheaper methods before doing much of this expensive work.

features, old landmarks. While standing there an incident occurred to my mind that took place nearly 40 years ago. On the very ground where now stands the United States Reclamation Service buildings of Simms, Capt. C. C. Rawn, United States Army, and a merry party composed of ladies and officers from the military post were chasing buffalo. Poor Rawn went down to defeat that day, his mount falling and breaking his leg. One of the ladies of the party kindly tendered her underskirt to alleviate his sufferings while waiting for the post ambulance. Rawn, however, had got his buffalo before his accident. Poor fellow, he is gone, and his comrades suffered the loss of a prince of a good fellow and the service a brave and valiant officer.

But I digress. Let us return to the time in 1870, when Gen. John Gibbon, with his command, the Seventh United States Infantry, marched into the beautiful valley of the Sun River, taking station at Fort Shaw, one of the chain of frontier posts, having been completed in 1866. He barely settled down before he directed his attention to the possibilities in the rich alluvial lands, fine mountain streams, and the topography of the surrounding country.

As soon as the general got his command settled down to routine garrison duty, he called up his adjutant, First Lieut. J. M. J. Saum (and right here let me say that the splendid training received by our young men at West Point came prominently to the front) and directed him to requisition from the post quartermaster a transit and other equipment necessary for field engineering, and to detail from the command a corps of assistants, and proceed up Sun River, west, and from the nearest feasible point, run a level line to the post gardens on the bench southwest of the post. This survey was soon completed. The next order came like a thunder clap to Mr. Soldier, for mind you, a soldier as a general rule does not like manual labor, and here were all kinds of it looking him in the face. Nevertheless the boys had to take their medicine. All men not on guard or garrison police were ordered to report to First Lieut. J. M. J. Saum at fatigue call every morning. This included the regimental band. How those "wind jammers" did kick. This order remained in force until the completion of the first irrigating ditch on the Fort Shaw Reservation, and the largest ditch in this section. It was then considered a marvel in engineering skill. Our company gardens became the wonder of the surrounding country, and were worth thousands of dollars to the few settlers in this vicinity as a demonstration of the possibilities of our rich soil, when thoroughly and scientifically watered. Demonstration farming was a fad with Gen. Gibbon, though he did not beat his sword and cannons into plowshares, as he had other uses for those warlike instruments, as told in our history of western Indian wars. The Indian had become restless and resented the encroachment of the white man on his native hunting grounds.

A very amusing incident connected with the general's farming occurred in 1875. The advent of the Colorado beetle, now generally called the potato bug. That year they came in hordes. Here the general was confronted

with an enemy entirely new to him. There was consternation in camp. The general immediately ordered out the two 12-pounder Napoleon guns with arm chests filled with blank charges. He directed them placed at one end of the potato patch and bombarded said patch for fully one-half a day, Mr. Bug apparently enjoying the holiday. It was of no avail. His next move on the enemy was to order out long lariats stretched across the field, with bushes attached to the line at intervals, and have soldiers carry this line across the patch to and fro with the idea of dislodging the pest and driving them away. Mr. Bug complacently sat under his fig tree, occasionally expectorating on the soldiers' well polished shoes. This was more than the irascible old warrior could endure. He had fought rebel hosts during the rebellion, when he commanded the Iron Brigade to a successful issue, but here he was confronted by an enemy that completely baffled him. Not to be beaten, he next caused little piles of straw to be scattered over the patch, having soldiers stationed throughout the patch at convenient intervals, and at a given signal all were to ignite these piles of straw and try the efficacy of smudging. Mr. Bug evidently enjoyed the warmth created, nothing more. The general retired to his quarters damned and defeated by so insignificant an enemy as the common potato bug; 'twas humiliating. He then resorted to correspondence, and finally some one suggested Paris Green. Horrors! Use a virulent poison on so essential an article of food. But they finally concluded that it was Paris Green or the bug, and that they could first try it on the dog and if he survived, all would be well; and it was, and Mr. Bug is still a very conspicuous member of our bug community to this day. The foregoing is not fiction but an actual occurrence that came under the observation of the writer, who was a participant in the war on bugs.

Let us return to my cogitation on the Nauck Hill referred to previously.

I awaken from my dreams, my vision becomes clear, what do I see before me? Looking over that beautiful Sun River Valley where once roamed the buffalo, antelope, and deer, as free as the mountain air they breathed, three score or more of happy prosperous homes have been established there in the short space of two years. Marvellous! Who and what have given impetus to this wonderful feat of transformation? First, a corps of energetic young men, composing the Reclamation Service, with the support of a beneficent and broad-minded Government, the best under the sun. Second, an eager desire on the part of the best element of laboring men to get out of our congested and fetid cities, and into this life-giving, exhilarating, pure mountain air, and acquire homes of their own, and become good American citizens in all that the words imply.

Gens. Gibbon and Saum have both gone over to that silent majority, but their efforts in the interest of irrigation and reclamation have borne fruit and are still in evidence. They were truly pioneers in that respect in this section.

IRRIGATION STATISTICS, FOURTEENTH CENSUS.

The Director of the Census announces, subject to correction, the following preliminary statistics on irrigation for the counties named. Similar statements

for other counties will be issued as soon as the figures are available and will be published from time to time in the RECLAMATION RECORD.

Irrigation by counties, 1920 and 1910.

State and county.	Acreage to be irrigated by works either completed or under construction.			Acreage to which existing works are capable of supplying water.			Acreage irrigated.			Acreage available for settlement in 1920. ²
	1920	1910	Increase. ¹	1920	1910	Increase. ¹	1919	1909	Increase. ¹	
California:										
Alameda.....	16,527	2,605	13,922	13,050	1,872	11,178	9,351	1,859	7,492	.....
Contra Costa.....	49,125	32,640	16,485	46,472	32,562	13,910	44,833	26,856	17,977	8,600
Humboldt.....	664	966	-302	572	333	239	391	208	183	.....
Inyo.....	97,998	92,319	5,679	79,771	71,815	7,956	74,958	65,163	9,795	4,490
Mono.....	121,886	84,973	36,913	99,333	50,007	39,326	46,012	49,027	-3,015	40,050
Monterey.....	50,537	29,914	20,623	56,056	27,176	28,880	47,336	15,056	32,280	.....
Napa.....	1,403	2,443	-1,040	1,284	2,035	-751	660	1,191	-531	.....
Riverside.....	230,144	210,452	19,692	131,907	103,233	28,674	108,336	71,436	36,900	13,587
Sacramento.....	141,351	74,583	66,763	103,249	69,970	33,279	72,857	53,683	19,174	15,086
San Benito.....	23,053	20,067	2,986	17,252	13,790	3,462	12,519	7,186	5,333	.....
San Bernardino.....	186,784	152,415	34,369	120,628	86,107	34,521	105,481	70,278	35,203	8,679
San Francisco.....	412	383	29	412	383	29	372	333	39	.....
San Joaquin.....	324,099	173,563	150,536	230,763	77,083	153,680	183,853	59,811	124,042	.....
San Luis Obispo.....	11,229	2,539	8,690	10,878	2,416	8,462	5,302	1,687	3,615	.....
San Mateo.....	9,399	3,983	5,416	8,240	3,653	4,587	7,137	3,648	3,489	.....
Santa Barbara.....	37,875	13,603	24,272	34,494	13,572	20,922	16,420	12,012	4,408	.....
Santa Clara.....	86,510	60,140	26,370	74,977	50,939	24,038	71,274	37,637	33,637	.....
Santa Cruz.....	2,671	2,232	439	2,044	1,313	731	1,269	1,201	68	.....
Shasta.....	110,407	72,653	37,754	58,989	36,564	22,425	50,173	33,004	17,169	15,791
Sierra.....	18,547	18,249	298	15,873	17,505	-1,632	15,292	17,504	-2,212	300
Siskiyou.....	130,741	79,161	51,580	71,077	66,866	4,211	65,637	60,301	5,336	1,633
Solano.....	36,023	8,192	27,831	28,060	7,160	21,500	23,900	3,610	20,290	.....
Sonoma.....	11,256	951	10,305	3,163	761	2,402	2,126	631	1,495	.....
Tehama.....	44,720	33,020	11,700	39,387	23,167	16,220	23,260	14,281	8,979	4,971
Trinity.....	14,937	9,513	5,424	9,055	7,127	1,928	5,810	6,324	-514	357
Tuolumne.....	25,371	5,958	19,413	2,943	2,083	860	2,892	2,035	857	25
Ventura.....	50,737	56,357	-5,620	35,925	49,407	-13,482	31,716	25,273	6,443	.....
Yolo.....	104,376	55,967	48,409	65,249	14,697	50,552	42,273	11,764	30,519	.....
Yuba.....	71,185	46,322	24,863	24,049	6,401	17,648	20,773	3,073	17,700	6,725
Oregon:										
Gilliam.....	4,733	3,370	1,363	3,937	2,367	1,570	3,440	2,087	1,353	.....
Grant.....	42,079	73,578	-31,499	38,690	38,631	59	32,414	36,069	-3,655	70
Harney.....	224,237	561,548	-337,311	155,808	136,631	19,187	118,979	129,135	-10,156	.....
Malheur.....	203,607	208,025	-4,418	140,279	79,210	61,069	106,388	67,626	38,762	10,000
Morrow.....	20,337	14,937	5,400	12,434	8,116	4,318	10,427	7,541	2,886	.....
Umatilla.....	84,115	94,109	-10,054	63,787	50,213	13,574	56,040	31,022	25,018	6,200

¹ A minus sign (-) denotes decrease.

² To be supplied with water by works either completed or under construction.

FEBRUARY WEATHER IN THE WESTERN STATES.

By P. C. Day, United States Weather Bureau.

Mild, dry weather was the dominating feature of February in the Western States, as it had been during January.

In the far Northwest precipitation came frequently, though the final week had but little. In California and Idaho the second week was wetter than any other, but in the middle Plateau region and in Nebraska the first week. Most of the southern half of the Plains had liberal precipitation during the third week. The last week of the month was notable for the absence of rainfall over a very large part of the West, but a portion of southwestern Texas received astonishingly heavy rain on the closing days. The whole month had considerably more than the usual quantity of precipitation in the region between the Cascade Mountains and

the Pacific, also in portions of western Texas; and there were districts which had a little more rain than normal in northwestern California, in the Snake River basin, and in the middle Plains. Generally speaking, however, the West had considerably less precipitation than is usually likely during February, and the shortage was especially marked in Nevada and Arizona, most counties of California, the central and southern parts of Utah, and the western and northern parts of New Mexico; also along and near the Continental Divide in Idaho, Montana, and northern Wyoming.

The month was mainly favorable for outdoor work, and in all but a few portions was very good for live stock. In many districts the fruit buds have been developed to a stage which seems perilous so early in the season.

MONTHLY PROGRESS REPORTS FOR FEBRUARY.

Monthly conditions of principal Reclamation Service reservoirs for February, 1921.

[Elevation above sea level.]

State and project.	Reservoir.	Available capacity, in acre-feet.	Elevation.		Storage in acre-feet.			Out-flow in acre-feet.	Elevation of water surface.		
			Spill-way crest. ¹	Lowest gate sill. ²	Beginning of month.	End of month.	Maximum.		Beginning of month.	End of month.	Maximum.
Arizona, Salt River.....	Roosevelt ³	1,305,000	2123	1903	925,266	896,194	925,266	29,072	2099.18	2097.08	2099.18
California, Orland.....	East Park.....	51,000	1111.68	1199.68	48,800	48,700	49,800	11,430	1199.03	1198.41	1199.03
Idaho:											
Boise.....	Arrowrock.....	280,000	3211	2956	117,900	135,400	135,400	5,806	3143	3152.2	3152.2
	Deer Flat.....	177,000	2518	2488	80,796	123,876	123,876	.....	2506.25	2512.02	2512.02
Minidoka.....	Lake Walcott.....	95,180	4245	4236	83,540	84,350	86,330	346,791	4244	4244.07	4244.24
	Jackson Lake.....	847,000	6769	6730	280,260	295,480	295,480	570	6744.8	6745.52	6745.52
Montana:											
Milk River.....	Nelson.....	25,000	2214	2200	17,700	17,000	17,700	.....	2208.6	2208.3	2208.6
St. Mary Storage.....	Sherburne.....	33,000	4788	4720	.....	.....	.....	.....	.....	.....	.....
Sun River.....	Willow Creek.....	16,700	4130	4085	12,686	12,878	12,878	.....	4125.8	4126	4126
Nebraska-Wyoming, North Platte.....	Pathfinder.....	1,070,000	5852	5670	715,330	741,950	741,950	6,665	5833.46	5835.1	5835.1
	Lake Alice.....	11,400	4182	4159	6,206	5,630	6,206	.....	4174.4	4173.5	4174.4
	Lake Minatare.....	60,700	4125	4074	48,021	47,243	48,021	.....	4118.8	4118.4	4118.8
Nevada, Newlands.....	Lake Tahoe.....	120,000	6230	6224	.....	.....	.....	.....	6224.85	6224.98	6224.98
	Lahontan.....	290,000	4162	4060	140,400	154,750	154,750	.....	4144	4146.7	4146.7
New Mexico:											
Carlsbad.....	McMillan.....	45,000	3267.7	3241.6	30,750	33,750	33,750	.....	3261.5	3265.7	3265.7
Rio Grande.....	Elephant Butte.....	2,638,800	4407	4321.5	1,753,268	1,738,128	1,760,207	34,320	4381.88	4381.4	4382.1
Oregon, Umatilla.....	Cold Spring.....	50,000	621.5	560	45,550	49,650	49,700	.....	618.48	621.24	621.28
Oregon-California, Klamath.....	Clear Lake.....	462,000	4540	4514	299,000	348,000	348,000	.....	4533.51	4535.6	4535.6
South Dakota, Belle Fourche.....	Belle Fourche.....	203,000	2975	2920	163,680	172,380	172,380	.....	2969.7	2970.9	2970.9
Utah, Strawberry Valley.....	Strawberry.....	250,000	7558	7517	203,350	206,200	206,200	.....	7551.5	7551.9	7551.9
Washington:											
Okanogan.....	Conconully.....	14,400	2290	2232	1,549	1,914	1,914	.....	2252	2254	2254
Yakima.....	Bumping Lake.....	34,000	3426	3389	10,565	10,280	13,135	2,855	3404.2	3403.9	3407.3
	Lake Clealum.....	22,800	2134	2122	25,100	26,985	29,565	2,580	2134.4	2135.3	2136.4
	Lake Kachess.....	210,000	2258	2192	165,720	185,435	185,435	.....	2245	2249.7	2249.7
	Lake Keechelus.....	152,000	2515	2425	79,005	104,835	104,835	.....	2480.9	2494.2	2494.2
Wyoming, Shoshone.....	Shoshone.....	456,600	5360	5132.3	293,846	276,877	293,846	39,655	5331.8	5328.3	5331.8

¹ Or maximum storage.² Or zero storage.³ Zero water depth at elevation of 1902.2.⁴ Amount of silt shown by silt survey deducted from original capacity.⁵ Proposed regulation.⁶ Estimated low-water limit under proposed plan of regulation.⁷ Vested power draft.

SALT RIVER PROJECT, ARIZONA.

Operation and maintenance of irrigation system.—

Water was out of the Maricopa Canal for three days and the Salt and Grand Canals for four days for cleaning purposes.

Two regular crews and one special maintenance crew were in the field during the month, and the following statement shows the average number of men and stock employed and the results accomplished: Average number of men, 81½; average number of stock, 3½; miles main canals cleaned, 13½; miles laterals cleaned, 14½; number of new structures installed, 13; number of old structures repaired, 53; riprap placed, 637 feet; dirt fill placed, 206 cubic yards; concrete placed, 38 cubic yards; corrugated iron pipe placed, 24-inch, 107 feet; concrete pipe placed, 24-inch, 118 feet.

The Austin trencher excavated 5,380 linear feet of trench for subdrainage in the Laveen District. In connection with this work 1,400 feet of 15-inch vitrified, 3,770 feet of 12-inch vitrified, and 680 feet of 12-inch concrete pipe were laid, 6,250 linear feet back filled, and 8 manholes completed, with a daily average of 23½ men and 9 head of stock.

The proposed work on the Highline Canal for increasing the water supply by installing 4 air vents and raising the surge tank 8 feet was completed. Siphons under both branches of the Arizona Eastern

Railroad crossing the Western Canal were completed. The siphons under the Tempe Canal were completed. All the proposed construction except the installation of three new motors was completed within 10 days.

About the middle of March delivery is expected of the new runners for the pumps. This installation will be made by tearing down one pump at a time. It is hoped to have the pumping plant in operation continuously by running three pumps while the fourth one is under repair. This work, it is estimated, will increase the available water supply of the Highline 50 per cent.

The following statement shows the number of men employed and work accomplished on this job: Man days, 510; cubic yards excavation, 419; cubic yards concrete, 68; cubic yards rubble masonry, 10; cubic yards backfill, 330; 36-inch concrete pipe placed, 52 feet; 36-inch corrugated pipe placed, 40 feet; 30-inch concrete pipe placed, 108 feet; 24-inch steel pipe placed, 121 feet; 60-inch surge chamber raised, 8 feet.

Operation of power system.—The total power generated during the month was 4,625,420 kilowatt-hours.

The Roosevelt power plant operated 670.97 hours during the month and generated 3,826,000 kilowatt-hours. Transformer banks 3, 2, and 1 were overhauled, cleaned, and inspected. The cross-cut power plant operated 80 per cent of the month and generated

266,500 kilowatt-hours. The plant was given the regular winter overhauling. The Arizona Falls power plant operated 78 per cent of the month and generated 178,800 kilowatt-hours, the South Consolidated 99 per cent and generated 221,000 kilowatt-hours, and the Chandler plant 71.3 per cent, generating 133,120 kilowatt-hours.

All substations operated without trouble, and the pumping plants were operated as needed.

Construction work.—At Twohy Bros. Co.'s Tempe gravel plant there was installed three 11,000 to 2,200 volt, 25-kilovolt-ampere transformers, one 40-horsepower motor, one 50-horsepower motor, and about 1,500 feet of 3-phase 2,200-volt line; expense borne by Twohy Bros.

At Peoria the permanent 23,100 to 2,300 volt single-phase transformer was installed in place of transformers installed there temporarily.

At the Highline pumping plant the 230-kilovolt-ampere transformer for unit No. 4 was moved to make room for the new transformer that will come later. The 11,000-volt bus was extended and disconnecting switches installed, so that the new transformer can be installed when it arrives with a minimum disturbance to the rest of the plant.

Office.—A total of 168,209 acres was entitled to irrigation water service on the first of the month.—C. C. Cragin.

YUMA PROJECT, ARIZONA-CALIFORNIA.

Weather conditions were favorable throughout the month; the maximum temperature was 92°, believed to have been the hottest February day for 40 years. The first carload of grapefruit ever shipped from Yuma was sent to Los Angeles by the Hill Orchard. Porter J. Preston appointed project manager vice W. W. Schlecht, resigned, arrived February 21, and a reception and dance were given in his honor on the evening of February 22.

Construction.—The Bucyrus drag line advanced 0.53 mile along the East Drain, excavating 19,500 cubic yards of earth. Two timber bridges were built on the Main Drain and a ditch-rider's house begun. A Bucyrus 30-B drag line was received February 15.

Operation and maintenance.—Ten thousand acre-feet of water were delivered to users. Monighan drag line No. 1 completed cleaning the Somerton Canal and was tied up for overhauling. During the month this machine cleaned 0.65 mile of canal, excavating 8,600 cubic yards of silt. Monighan drag line No. 2 was laid up for repairs the whole month. Ruth dredger No. 6, on the Indian reservation, cleaned 2.9 miles of laterals, excavating 2,800 cubic yards of silt; in the Yuma Valley Ruth dredgers No. 7 and No. 8 cleaned 7.25 miles and 4.5 miles of laterals, excavating 6,400 cubic yards and 4,000 cubic yards of silt, respectively. A fourth Ruth machine (No. 9) started work February 15 and cleaned 1.5 miles of lateral, excavating 1,300 cubic yards of silt.

The maximum discharge of the Colorado River was 11,000 second-feet; minimum, 6,000 second-feet. On February 28 the gauge height was 15.9, with a discharge of 7,700 second-feet. The total discharge for the month was 409,000 acre-feet.

Imperial Valley investigations.—Work has been completed, except for the final report of soil survey, which is being prepared.

Arizona cooperative work.—A board of engineers, consisting of F. W. Hanna, James Munn, and C. C. Fisher, reviewed the Fisher report on the San Carlos project and wrote a board report, which was completed February 21.

Official visitors were Brooks Fullerton, district counsel; C. A. Lyman, of the Washington office; Consulting Engineers F. W. Hanna and James Munn; W. M. Bager, chief engineer of the Bucyrus Co.; O. P. Morton, special assistant to the United States Attorney General; A. T. Strahorn, United States Bureau of Soils; and W. W. Schlecht, former project manager.—Porter J. Preston.

YUMA AUXILIARY PROJECT, ARIZONA.

February weather conditions were favorable for construction work. The crushing plant at the Mesa quarry was operated continuously during the month. Two 75-horsepower Holt caterpillar tractors were used, working two shifts, to haul the crushed rock to the road, the average haul being about 7½ miles; 7,000 feet of road were surfaced during the month, 1,325 cubic yards of crushed rock being used. Construction work on the B Lift pumping plant was commenced, camp and construction plant being erected. The excavation for the substructure and forebay was made and on February 25 the concrete in the base of the pump inlet was poured. Construction material, lumber, reinforcing steel, and cement were being hauled to the plant site. The 36-inch gate valve was received and delivered to the site.

The 30-B Bucyrus drag-line excavator to be used in raising the bank of the project East Main Canal was received and erected.

Office engineering consisted of study of plans and designs of structures and making drawings and designs for a permanent camp at the Mesa quarry.—Porter J. Preston.

ORLAND PROJECT, CALIFORNIA.

February weather was favorable for outside operations. The rainfall for the month was 0.82 inch, making the total to date for the season 17.92 inches. Eleven thousand four hundred acre-feet of water were wasted over the spillway at East Park.

Nine miles of laterals were cleaned and repaired during the month. An average force of 75 men and 18 head of stock was employed on concrete lining, placing 40,000 square yards.

On the farms more development work was in progress than has been undertaken for the past four years. There will be a large increase in the acreage planted to orchard and alfalfa. A number of sales of undeveloped land was made and there was considerable building activity throughout the project. The attendance of water users at the annual meeting held on the 26th for the election of directors of the association was the largest in the history of the project.—A. N. Burch.

GRAND VALLEY PROJECT, COLORADO.

Exceptionally warm weather prevailed during February. There was no frost in the ground, very little precipitation, and conditions were favorable for construction and maintenance work. Ample labor was available for the needs of the project.

The price of hay and other farm produce remained at a low figure. Alfalfa hay dropped to \$10 per ton in the stack and the demand was not very strong even at the reduced price. The project farmers, however, were far from being discouraged and most of them were busy preparing for their spring work. The exceptionally favorable weather conditions permitted them to begin their spring plowing much earlier than usual.

The maintenance forces were reduced to a minimum at the beginning of the month as the greater part of the necessary work was completed during the fall months. Extensions to the Big Salt Wash and the Mack Wash flumes were completed and work was started on the repair of the metal flume at station 1274. A small crew was engaged in placing riprap in the upper section of the main canal just below the headgates. At the end of the month work was started on burning weeds, and miscellaneous repair jobs necessary to put the system in good shape for the beginning of the season's operation.

The drainage construction was prosecuted throughout the month with two dragline excavators working on the cooperative contract in the Grand Valley Drainage District and one excavator on the project. The new one-half yard P. & H. drag line also started operation on the project during the month; 1.8 miles of open drain were completed, involving 39,000 cubic yards of excavation. The work of overhauling all of the machines and putting them in good condition for the season's work was finished.

Visitors on the project during the month were Messrs. Kato and Ito, Japanese engineers who inspected the Grand River Dam; W. A. Meyer, examiner of accounts; and J. R. Alexander, district counsel.—*S. O. Harper.*

UNCOMPAHGRE PROJECT, COLORADO.

February weather continued favorable for brushing canal banks and the usual spring maintenance work.

The P. & H. drag line completed the work on the Ironstone slide between mile post 0+86 and station 1+03, and then moved to the Ironstone headgates for gravel-cleaning purposes.

The work of leveling and underpinning the concrete pier on the West Canal flume over the Uncompahgre River was begun during the latter part of the month.

Small quantities of water were carried in nearly all the canals during the latter part of the month for stock and domestic purposes.

Labor continued plentiful and no further changes were made in the wage schedule which was announced for the project to become effective February 1.

W. A. Meyer, examiner of accounts, inspected the project from February 15 to 22, inclusive.—*L. J. Foster.*

BOISE PROJECT, IDAHO.

Mild, cloudy weather prevailed during February. Light showers or snowstorms occurred at intervals.

Labor conditions.—The number of unemployed was reduced to a slight extent by the beginning of spring work on the farms and by highway work, which was resumed.

Farming operations.—By the latter part of the month plowing was under way over the greater part of the project. A small amount of hay was baled and shipped, but the price received was unsatisfactory to the growers.

Water supply.—The flow of Boise River was about 26 per cent above the mean for the past 25 years. At

Crop report, Uncompahgre project, Colorado, 1920.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Average per unit of yield.	Total.	Average per acre.
Alfalfa hay.....	25,520	Ton.....	82,737	3.2	\$9.93	\$821,580	\$32.19
Alfalfa seed.....	817	Bushel.....	1,893	2.3	11.77	22,273	27.27
Apples.....	1,830	Pound.....	19,816,060	10,828.4	.0177	352,372	192.55
Barley.....	184	Bushel.....	4,118	22.4	1.23	5,065	27.53
Beans.....	301	do.....	2,969	9.9	3.27	9,704	32.25
Beets (sugar).....	4,800	Ton.....	35,373	7.4	11.00	389,103	81.07
Clover hay.....	101	do.....	128	1.3	8.20	1,050	10.38
Clover seed.....	151	Bushel.....	343	2.3	13.35	4,581	30.34
Corn (Indian).....	2,281	do.....	72,737	31.9	1.01	73,507	32.23
Corn fodder.....	120	Ton.....	583	4.9	4.70	2,738	22.82
Corn ensilage.....	313	do.....	1,935	6.2	8.26	15,992	51.09
Fruits, small.....	47	Pound.....	74,633	1,588.0	.18	13,434	285.83
Garden.....	291	do.....	613	1.4	8.52	31,462	108.11
Hay.....	432	Ton.....	613	1.4	8.52	5,222	12.09
Oats.....	5,878	Bushel.....	204,366	34.8	.72	146,530	24.93
Onions.....	433	do.....	122,862	283.7	.55	67,475	155.83
Pasture.....	7,501	do.....	774,120	9,798.9	.026	38,607	5.15
Peaches.....	79	Pound.....	78,880	11,268.6	.0246	20,141	254.95
Pears.....	7	do.....	20	20.0	1.50	1,940	277.13
Peas.....	1	Bushel.....	4,050	1,350.0	.07	30	30.00
Prunes.....	3	Pound.....	1,397,266	226.6	.624	283	94.33
Potatoes, white.....	6,166	Bushel.....	108	9.0	1.25	872,000	141.42
Rye.....	12	do.....	108	9.0	1.25	135	11.25
Wheat.....	10,810	do.....	320,754	29.7	1.55	496,247	45.92
Miscellaneous.....	123	do.....				6,029	49.02
Less duplicated areas.....	4,471						
Total cropped.....	63,730	Total and average.....				3,397,500	53.30
			Areas.		Acres.	Farms.	Per cent of project.
Irrigated, no crop:							
Nonbearing orchard.....	84						
Young alfalfa.....	2,067						
Ground, fall plowed.....	3,540						
Miscellaneous.....	99						
Less duplicated areas.....	5,340						
Total irrigated.....	64,180						
			Total irrigable area of farms reported.....		84,460	1,588	84
			Total irrigated area of farms reported.....		64,186	1,588	64
			Irrigated under rental contracts.....		64,186	1,588	64
			Total cropped area of farms reported.....		63,735	1,588	64

the end of the month the amount of water stored in both Arrowrock and Deer Flat Reservoirs was greater than any previous year for the corresponding period. From present indications the run-off during the year will be heavy.

Operation and maintenance.—Heavy roads and rains delayed the starting of spring maintenance work. By the latter part of the month canal cleaning and repair work was resumed over the entire project. Water was run through the Main Canal for filling Deer Flat Reservoir during the entire month.

Construction.—Work on the Notus Canal, which will irrigate about 6,000 acres in the Black Canyon irrigation district, progressed at a satisfactory rate. The entire length of the Main Canal which is being excavated by contract is opened up. The structures were completed with Government forces on all stretches that have been finished.

Drainage.—No excavation was in progress on drainage work. One crew was employed on the completion of structures on the drainage system in the Big Bend and Riverside irrigation districts.

Surveys.—Field work was confined to the construction work in progress and in staking out small structures necessary in connection with the operation and maintenance work. Office studies were carried on in connection with the proposed Hillcrest division.

Visitors.—H. N. Bickel, examiner of accounts, was on the project from February 14 to 21.—*J. B. Bond.*

KING HILL PROJECT, IDAHO.

February weather was favorable for construction work. There was a total snowfall of 12 inches and a total precipitation of 0.86 inch for the month.

At Camp 6 a small force of men completed the McEachren wood-stave flume on trestle. Dismantling camp and repairing equipment were continued. One field party was engaged in securing data for next season's work. The office engineering force was engaged on designs and estimates, as well as the compilation of the project history. The maintenance force of the King Hill irrigation district was engaged in repairs to wooden structures.—*E. C. Pantone.*

MINIDOKA PROJECT, IDAHO.

Little outside work was carried on during the month. The weather was generally mild in the latter part, although the minimum temperature of the winter was reached on the 6th, when the thermometer fell to 9° below zero. The ground generally was very wet and muddy, so that transportation over the project was difficult.

A carload of copper wire was received to be used in rebuilding the B1 transmission line from the dam to the pumping stations.

Shipments of farm products from the project were heavy, amounting to 560 carloads. This included 134 of alfalfa hay, 53 of grain and grain products, 173 of potatoes, 198 of live stock, and 2 of molasses. Prices were generally low. Hay was quoted at \$4 per ton in the stack and \$9 f. o. b. cars. Wheat was \$1.20, and potatoes 40 cents per bushel.

Announcement of the operation and maintenance charges for the season of 1921 was issued by the Secretary of the Interior. A rate of 60 cents per acre-foot for water used up to June 5 and after September 15, and \$1.30 per acre-foot for water

Crop report, King Hill project, Idaho, 1920.

[Data furnished by King Hill Irrigation District, which operates project. This was built under private auspices and is being reconstructed by the United States.]

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	3,300	Ton.....	11,720	3.5	\$11.96	\$140,120	\$42.44
Alfalfa seed.....	135	Bushel....	671	5	10.85	7,280	53.92
Apples.....	277	Pound.....	194,706	708	.04	7,960	28.73
Barley.....	67	Bushel....	1,465	22	1.10	1,610	24.10
Clover hay.....	13	Ton.....	19	1.5	15.00	285	21.92
Clover seed.....	13	Bushel....	150	12	5.33	800	61.54
Corn, Indian.....	106	do.....	3,345	32	1.43	4,770	45.04
Corn fodder.....	7	Ton.....	17	2.5	7.53	130	18.29
Fruits, small.....	13	Pound.....	11,050	850	.10	1,100	85.00
Garden.....	47					8,880	188.83
Hay.....	11	Ton.....	37	3.5	13.38	495	45.00
Melons.....	46	Pound.....	286,586	6,230	.02	4,990	108.59
Oats.....	151	Bushel....	6,093	40.5	.96	5,830	38.62
Pasture.....	190					2,530	13.32
Pears.....	21	Pound.....	26,920	1,282	.04	1,040	49.52
Potatoes, white.....	125	Bushel....	8,322	66.5	2.50	20,770	166.21
Wheat.....	238	do.....	3,569	15	2.22	7,910	33.26
Less duplicated areas.....	240						
Total cropped acreage.....	4,520		Total and average.....			216,500	47.90
Irrigated, no crop:							
Nonbearing orchard.....	58						
Young alfalfa.....	204						
Total irrigated.....	4,782		Areas.		Acres.	Farms.	Per cent of project.
			Total irrigable area farms reported.....		7,556	117	46.7
			Total irrigated area farms reported.....		4,783	117	29.5
			Total cropped area farms reported.....		4,521	117	27.9

used between June 5 and September 15 was fixed, with a minimum charge of \$2 per acre on all lands.

On account of the financial conditions receipts for 1920 operation and maintenance charges were very light. Only about 15 per cent of the total amount due was paid in by the end of the month.

A petition addressed to the Secretary of the Interior was circulated among the water users asking that all maintenance and construction charges on the pumping unit be postponed for five years, and that the Government take steps to increase the water supply of the project.

At American Falls work was carried on throughout the month. Nine miles of levels were run, 16,570 acres of topography taken, and 9,620 acres of land classified. Digging of test holes and pits for the dam was continued. Good progress was made in the appraisal of property in the town for right-of-way purposes, and a number of tracts were purchased. The project manager made a trip to Omaha to confer with the officials of the Union Pacific Railway Co. in regard to proposed changes of the tracks of that road at American Falls.

Three 350-kilovolt-ampere transformers, which were removed from the Burley substation, were taken to Rupert on sleds for installation in the substation there. When that change has been made its capacity will be materially increased.—*Barry Dibble.*

Prevailing crop prices at close of February, 1921.

Project.	Alfalfa hay, per ton.		Barley, per bushel.	Oats, per bushel.	Wheat, per bushel.	Potatoes, per bushel.
	In stack.	Baled at shipping point.				
Salt River.....	\$18-\$22	\$24-\$28				
Yuma.....	15.00	18.00				
Orland.....	20.00	25.00	\$0.50		\$1.41	
Grand Valley.....	10.00	14.00	1.25	\$0.70	1.25	\$0.75
Uncompahgre.....	5-7		1.50	.60	1.05	.60
Boise.....	5.00	10.00	.55	.65	1.20	.40
King Hill.....	10.00			.64		.87
Minidoka.....	4.00	9.00	.75	.60	1.20	.40
Huntley.....	6.00	10.00			1.36	1.20
Milk River.....	8-10	10-14	.29	.22	1.39	1.50
Sun River.....	8.00	13.00	.60	.65	1.29	.60
Lower Yellowstone.....	10-15		.75	.60	1.40	1.00
North Platte.....	5-00		.50	.30	1.00	.50
Newlands.....	10.00	14.00				
Carlsbad.....						
Rio Grande.....		24.00				
North Dakota pumping.....	15.00			.50	1.43	1.25
Umatilla.....		10.50				
Klamath.....	15.00	25.00	.60	.48	1.50	1.70
Belle Fourche.....	3-6	10.00	.48	.32	1.40	1.20
Strawberry Valley.....	15.00	16.50	.93	.69	1.50	1.00
Okanogan.....	20.00	25.00				1.00
Yakima:						
Sunnyside unit.....	11.00	15.00				.50
Tieton unit.....	11.00	15.00				.50
Riverton.....						
Shoshone.....		4-8		.50	1.28	.36
Indian projects:						
Blackfeet.....	10.00		.90	.65	1.31	
Flathead.....	12.00	16.00		.56	1.34	
Fort Peck.....	10.00	13.00		.36	1.45	1.50

HUNTLEY PROJECT, MONTANA.

February weather continued mild, except from the 17th to the 20th, when minus temperature occurred. The only precipitation of the month was on the 15th, when 6 inches of snow fell.

The principal field work during the month was on repairs to drains. One small crew was engaged in cleaning the closed drain trap boxes of silt and sand, and another crew was used to repair several holes in Drain No. 11, caused by settlement or breaking of the tile. The small Austin No. 4 drag line started to convert about 1,800 feet of closed Drain No. 26 into an open drain. On the last day of the month work was started replacing deteriorated timber trap boxes by ones constructed of creosoted timber.

On February 9 about 300 water users met in the Du Frain Hall at Worden, Mont., and voted to circulate petitions for the formation of the Huntley Project Irrigation District.

There was an abundance of labor and teams available for all work.

The frost was about all gone, and work was being pushed in getting spring work started.—*Wm. M. Green.*

MILK RIVER PROJECT, MONTANA.

February weather was exceptionally mild. The mean temperature of 27.2 was about 16° above normal; however, the ground was frozen so that it was impractical to do any earthwork. There was no snow on the ground at the end of the month, and not much at any time during the month. Labor supply was ample.

Construction by contract.—Work was nearly completed on the 3-room cottage at Vandalia Dam and well under way on lodging house at Saco.

Construction by Government forces.—An addition to the Saco garage was built.

Operation and maintenance.—Repairs were made to Alkali Creek Siphon, and weed burning was in progress. A second small drag line was received from the makers. A number of stop planks were sawed out in the yard for use on various structures, and a few wooden turnouts were also fabricated in the yard. A part of the operation force was utilized on bench levels, drainage investigations, and other surveys.—*Geo. E. Stratton.*

ST. MARY STORAGE DIVISION.

February weather was exceptionally mild and fair, with light precipitation out of the mountains, where snow conditions were estimated to be only 75 per cent of normal for this season of the year.

All camps were in charge of caretakers and no construction work was attempted, excepting miscellaneous small jobs, such as repairs to equipment and buildings, building of a standard shelter house for the automatic gauge below Sherburne Lakes Dam, care and feeding of Government stock, and similar work of this nature.

The project manager returned on February 26, after an absence of several weeks attending conferences in Washington in connection with Blackfeet project appropriations and related matters.—*R. M. Snell.*

SUN RIVER PROJECT, MONTANA.

February weather was mild, but windy, with practically no precipitation.

At Pishkun Reservoir 18 men and 36 head of stock completed the surfacing of Dike No. 3 with gravel on the 8th and were engaged during the remainder of the month in hauling rock for paving Dike No. 4. A small increase in the force was made near the end of the month to insure completion of this work at an early date.

On Pishkun Canal a small crew completed the removal of rock and dirt that had fallen around the wood-stave pipe at Sun River Crossing. Some work was done in surfacing the operating road along the upper portion of Pishkun Canal.

No maintenance work was done on the Greenfields Division. Concrete foundations were built for the new storehouse and roads were graveled at the Fairfield headquarters.

On the Fort Shaw Division river protection work at the main canal headworks was completed and repairs were made to telephone lines and fences at Willow Creek Reservoir. Water was turned into the Fort Shaw Canal on the 26th for a short run for stock and domestic use.

Farmers were engaged in baling hay and marketing produce, and some plowing was done, although in most places the ground was too dry to plow. Reports on winter wheat were unfavorable. Carload shipments from the project were about 18 per cent less than in January; prices continued low and the demand was limited; 13 cars of wheat, 29 of hay, 4 of potatoes, and 1 of sheep were shipped from the project during the month.—*Geo. O. Sanford.*

LOWER YELLOWSTONE PROJECT, MONTANA-NORTH DAKOTA.

Thus far the winter of 1920-21 has been a record breaker. The mean temperature for February was 15° above normal and the precipitation amounted to only 3 inches of snow which remained on the ground only a short time as thawing temperatures prevailed during 21 days of the month.

The overhauling and repairing of drag-line excavator No. 1 was completed on the 23d and the repair work on excavator No. 3 was nearly completed. The small crew retained on maintenance work was engaged in riprapping the Beef Slough Drain and removing willows and cottonwoods from the main canal.

Surveys were carried on for revisions of lateral locations and field data were secured for the preparation of maps relative to the location of all canals and plans preparatory to issuing of specifications.

At the special election which was held on the 19th to determine whether or not the electors of Irrigation District No. 2 were in favor of entering into a contract between the district and the United States similar to the one which Irrigation District No. 1 has completed, the returns showed that 67 were in favor and 1 opposed. It is only a matter of short time when both Irrigation Districts Nos. 1 and 2 will be going concerns in position to carry on in business-like manner the proper development of the project and every acre of the project should be producing crops that will compare favorably with any of the Federal reclamation projects.—*L. H. Mitchell.*

NORTH PLATTE PROJECT, NEBRASKA-WYOMING.

The weather for February was very favorable for the project work. A light snow fell on the 6th, followed by cooler weather. The frost was out of the ground by the end of the month except in shaded locations.

Operation.—A uniform amount of 100 second-feet was discharged from the Pathfinder Reservoir throughout the month for the use of the city of Casper.

The Fort Laramie Canal was operated as far as mile 25.5 to furnish water for the Lingle power plant.

Maintenance.—Little maintenance work was done except a small amount of necessary minor repair

work. Monighan drag line No. 4 discontinued work on the Interstate Canal banks on the 9th on account of frozen ground. During the working period 5,482 cubic yards of material were moved.

Crops.—There was an unusually large amount of crops on hand for this season of the year and apparently little market. Alfalfa was selling at \$5 per ton in the stack and most of the other crops were selling at low prices.

Live stock.—There was little movement of live stock. It is estimated that approximately 5,000 sheep and 500 cattle were shipped out during the month and that there were still about 30,000 sheep and 4,000 cattle on feed on the project.

Drainage.—On the Fort Laramie unit electric drag line No. 131313 continued work on the Cherry Creek Drain, operating with two shifts daily and excavating 28,368 cubic yards of class 1 material.

Construction.—Storage division: Good progress was made on the construction of the new outlets at the Pathfinder Dam. During the month the forces excavated 169 cubic yards of class 3 material from the new tunnel, leaving only 23 feet to be completed. The new cables were strung on the cableway. The hauling of the new valves and emergency gates was completed.

Fort Laramie division: Electric drag line No. 131312 continued work on the East Springer Lateral, operating with two shifts daily, excavating 19,550 cubic yards of material and completing 1.27 miles of lateral. Drag line No. 131343 continued work on the Fort Laramie Canal, operating with two shifts daily, excavating 33,135 cubic yards of class 1 material and completing 0.70 mile of canal. Drag line No. 131345 continued work on the Fort Laramie Canal, operating with two shifts daily, excavating 35,450 cubic yards of material, including 3,525 cubic yards of class 2 and 2,050 cubic yards of class 3 and completing 0.52 mile of canal. Drag line No. 121150 continued work on the excavation of the wasteway at mile 25.5 of the Fort Laramie Canal, operating with one shift daily and excavating 4,790 cubic yards of material, including 794 cubic yards of class 2 material.

The powder crew drilled 2,774 linear feet of holes and used 5,325 pounds of T. N. T. in blasting classified material ahead of the drag lines on the Fort Laramie Canal.

The construction forces at the Cherry Creek and Fairview camps made good progress on the construction of structures, the weather and ground conditions being favorable.

Northport division: Electric drag line No. 131344 continued work on the Northport Canal, operating with two shifts daily, excavating 38,753 cubic yards of material, including 1,100 cubic yards of class 2 and completing 1.39 miles of canal.

Good progress was made on the construction of the Indian Creek Siphon.

Fair progress was made by the contractors at work on lateral excavation.

Power system.—The Lingle power plant was operated continuously throughout the month with three shifts daily. In addition to the power used for construction purposes, 1,800 kilowatt-hours were delivered to Lingle, Wyo.; 26,700 kilowatt-hours to Torrington, Wyo.; 8,800 kilowatt-hours to Morrill, Nebr.; and 32,800 kilowatt-hours to Mitchell, Nebr.

Surveys.—Work was continued on the irrigable area surveys in the Upper Cherry Creek Valley and under the Springer Lateral system when weather conditions would permit, preparatory to the preparation of farm-unit plats for the land opening to be held this fall.

General.—The Great Western Sugar Co. has announced two forms of contract for the 1921 sugar-beet contracts, one at a flat rate of \$7 per ton and the other providing for payment on a sliding scale. The latter or sliding-scale contract provides for payment at the rate of \$1.25 per ton of beets above the average net price per 100 pounds of sugar received by the company for all sugar of the 1921 crop sold during the period commencing October 1, 1921, and ending September 30, 1922, as shown by the company's books of account. A minimum payment of \$6 per ton is guaranteed and is payable the 15th of each month for the beets delivered during the previous calendar month, further payments to be made from time to time as the net selling price of sugar and the quantity sold may justify, and final payment to be made not later than October 15, 1922. These prices will prevail for beets grown for the company's factories in the North Platte Valley.—*H. C. Stetson.*

Project weather during February, 1921.

Project.	Station.	Temperature, °F.			Precipitation (inches).
		Maxi-mum.	Mini-mum.	Mean.	
Salt River.....	Phoenix, Ariz.....	92	31	57.6	0.11
Yuma.....	Yuma, Ariz.....	92	37	60.1	.03
Orland.....	Orland, Calif.....	71	30	49.2	.82
Grand Valley.....	Grand Junction, Colo.....	68	16	37.8	.32
Uncompahgre.....	Montrose, Colo.....	64	10	34	.19
Boise.....	Boise, Idaho.....	63	13	35.4	1.23
King Hill.....	Glenns Ferry, Idaho.....	65	8	41	.86
Minidoka.....	Burley, Idaho.....	59	-9	31.9	.88
Huntley.....	Ballantine, Mont.....	64	-15	30.3	.28
Milk River.....	Malta, Mont.....	63	-14	27.2	.10
St. Mary storage.....	Near Babb, Mont.....	57	-10	28	1.15
Sun River.....	Fort Shaw, Mont.....	65	-1	31.7	.01
Lower Yellowstone.....	Savage, Mont.....	63	-6	27.5	.26
North Platte.....	Wyncote, Wyo.....	66	-11	32	.21
Newlands.....	Fallon, Nev.....	78	6	39	.03
Carlsbad.....	Carlsbad, N. Mex.....	82	21	39.5	.58
Rio Grande.....	El Paso, Tex.....	80	25	49	.26
North Dakota pump-ing.....	Williston, N. Dak.....	54	-13	22	.21
Umatilla.....	Hermiston, Oreg.....	62	13	40	2.07
Klamath.....	Klamath Falls, Oreg.....	58	11	33.8	1.65
Belle Fourche.....	Orman, S. Dak.....	64	3	32.4	.....
Strawberry Valley.....	Provo, Utah.....	64	4	34.5	1.96
Okanogan.....	Omak, Wash.....	48	-3	29.1	.42
Yakima:					
Sunnyside.....	Sunnyside, Wash.....	65	18	39	.79
Tieton.....	Cowiche, Wash.....	55	14	34.5	1.37
Riverton.....	Diversion Dam, Wyo.....	61	19	30.6	.02
Shoshone.....	Powell, Wyo.....	65	-2	31.3	T.
Indian projects:					
Blackfeet.....	Browning, Mont.....	52	-8	23.5	.59
Flathead.....	St. Ignatius, Mont.....	60	0	34	.46
Fort Peck.....	Poplar, Mont.....	61	-12	26.8	.04

NEWLANDS PROJECT, NEVADA.

February weather conditions were extremely favorable for all project work.

On February 1 the hearing before the district court for the confirmation of the organization of the Truckee-Carson Irrigation District, and the plans for the assessment of drainage benefits was again commenced, having been continued from January 12, 1921. The court was in session through February 11, being adjourned until March 1.

On February 9 a hearing was had in Washington before the Secretary of the Interior on the proposed power development by the Nevada Valleys Power Co. on Truckee River below the intake for the feed canal leading to Spanish Springs Reservoir. Definite

conclusions were not reached, and a further hearing will be held later in Denver.

On February 14 a meeting held by the board of directors of the irrigation district with the project manager in attendance, for the consideration of drainage and other project matters. The board named a committee of water users to accompany the project manager for an examination of lands proposed to be served with Truckee River water from Spanish Springs Reservoir. Messrs. Edmund Dietz, W. H. Austin, and C. E. Coe were named on this committee.

Construction.—Practically the only construction work in progress consisted of the reconstruction of the R Lateral over a length of 1½ miles and the installation of a timber check structure at station 31+50 in the R4 Lateral. Several timber structures were cut and hauled to points of installation.

Water supply and use.—Storage in Lahontan Reservoir increased 14,380 acre-feet during February, representing a total of 154,780 acre-feet at the end of the month. The surface of Lake Tahoe rose 0.13 foot to elevation 6224.98.

The depth of snow on the ground at Summit, Calif., was 106 inches on February 28, having decreased 14 inches during the month.

Operation and maintenance.—Toward the end of the month a small flow of water was turned into the S Line Canal to raise the ground water in the area from which the city of Fallon pumps its water supply. Water was also turned into certain other canals and laterals for flushing and priming purposes.

Maintenance work consisted of the cleaning of about 31 miles of laterals in the various districts, using teams and scrapers. Many of the water users assisted in this work. Labor conditions were excellent.

About 6 miles of laterals were also cleared of willows and brush in the various districts.

Drag-line excavator No. 4 cleaned and enlarged the H Lateral over a length of about 9,500 feet, having cleaned this lateral its entire length to station 149 at the end of the month.

Drag-line No. 2 started to work late in the month on the D2 Lateral and cleaned the same over a length of 900 feet.

The new Austin drag line was laid up awaiting repair parts after completing a small amount of work on the Harmon Lateral.

It is expected that the greater portion of the maintenance work will be completed by March 15—*John F. Richardson.*

CARLSBAD PROJECT, NEW MEXICO.

February weather was warm and pleasant; no low temperature was recorded. There was 0.58 of an inch precipitation on the last two days of the month, which was very welcome to the project in general and the ranch country around it. The total run-off of the Pecos River amounted to 12,878 acre-feet, or an average of 468 acre-feet per day. The maximum flow was 558 acre-feet and the minimum 350 acre-feet.

Labor was plentiful for all classes of work. There has been a great improvement in efficiency in labor since it became more plentiful and wages lower.

Maintenance work consisted of continuance of the regular winter repairing and cleaning work in the canal and lateral system. Work was commenced on the relief lateral for the Black River supply ditch. The supply ditch was originally constructed to take care of the land across Black River. Subsequently 800 acres of second unit land were admitted under

public notice. Since this land has all come under irrigation, the supply ditch has been inadequate to supply both the Black River demand and the demand for the new land. The supply ditch for about 2 miles is constructed of concrete. It was not possible to enlarge this section without great expense. A relief lateral built in earth is therefore necessary. This work is about 50 per cent completed. Several culverts and farm turnouts to take care of new lands were built during the month. The repair job on the east embankment of Lake McMillan was commenced late in the month. This work was made necessary by the dropping of the embankment at one point where water from the reservoir was finding its way through the gypsum underlying the embankment. Water was turned into the canal for winter irrigation of grain and young alfalfa on February 8. Cleaning of the B Drain in the Otis District was started early in February. This work is being done with the new Austin drag line recently purchased for the project.

There were 927 bales of cotton shipped to New Orleans markets during the month. Other shipments consisted of two carloads of cotton seed and three carloads of hay. From 400 to 500 bales of cotton were sold for project farmers on the New Orleans markets during the month. Prices obtained ranged from about 12 cents per pound to 21 cents, depending on grade and date of sale. The cotton market was on the decline during the entire month. These sales were all made at a loss to the grower. Based on the average production of cotton for the project during the past year, the cost of production amounted to about 25 to 28 cents per pound. The last of the cotton was picked and ginned before the 10th of February. The total amount of cotton ginned during the year amounted to 6,800 bales. There has been considerable activity in repairing land for 1921 crops during the entire month. The usual preparations for planting annual crops were well advanced for this time of the year. There is every evidence pointing to a smaller acreage in crops during the season of 1921, owing principally to financial stringency. Collections on

account of operation and maintenance and construction charges amounted to \$7,083 for the month.

Official visitors during the month were P. W. Dent, district counsel, on the 10th and 11th, and A. Lincoln Fellows, engineer, Bureau of Irrigation Investigations, Department of Agriculture, on the 21st.—*L. E. Foster.*

RIO GRANDE PROJECT, NEW MEXICO-TEXAS.

February weather was warm, with almost no precipitation. The inflow into the reservoir at San Marcial was extremely low for this period of the year, averaging about 800 second-feet per day.

Water for irrigation purposes was released from Elephant Butte Dam on February 11 and turned into most of the canals on the 15th and 16th. Irrigation of wheat and young alfalfa was begun at once as the ground was very dry owing to the winter. The demand for water was rapidly increasing.

Considerable spring wheat was being planted. It is expected that the acreage in wheat will be large as most of the land formerly seeded to cotton will probably be planted to wheat.

The usual winter cleaning was completed during the month; weeds were burned along the canal banks, and structures repaired.

T. E. Lester, of Las Cruces, was elected president of the State Federation of Farm Bureaus.

Seven carloads of corn and milo maize were purchased cooperatively by farm-bureau members at a saving of from 20 to 50 cents per bushel.

J. M. Black purchased 15 acres in Mesilla Park, including one of the finest homes in the valley, and will make a model dairy.

At Elephant Butte the filling of the voids on the pavement was continued and concreting of the paving began on March 1. On the excavation of the spillway channel considerable portions of the upper end were excavated to grade.

In the Rincon Valley construction continued on the Garfield Drain.

In the Mesilla Valley the raising of banks on the lower end of the Leasburg Extension Canal was com-

Crop report, Carlsbad project, New Mexico, 1920.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	6,250	Ton.....	18,155	2.9	\$18.61	\$338,024	\$54.08
Alfalfa seed.....	1,500	Lbs.....	390,410	260	.11	43,340	28.89
Cane.....	64	Ton.....	99.5	1.54	12.86	1,280	20.00
Corn, Indian.....	82	Bu.....	2,381	28.61	1.15	2,750	33.32
Corn, fodder.....	16	Ton.....	13.5	.843	11.63	157	9.81
Cotton.....	13,150	Lbs.....	2,746,196	.209	.16	445,727	33.88
Cotton seed.....	13,150	Ton.....	2,750	.418	15.00	41,250	3.15
Garden.....	17	Acre.....	.....	.....	.....	1,520	89.77
Oats.....	185	Bu.....	8,870	48.18	1.02	9,077	49.33
Pasture.....	280	.....	.....	.....	.....	4,700	16.74
Wheat.....	136	Bu.....	3,500	25.73	2.13	7,475	54.96
Less duplicated areas.....	14,650	.....	.....	.....	.....	.....	.....
Total cropped.....	20,180	Total and average.....	.....	.....	.....	895,300	44.44
		Areas.	Acres.	Farms.	Per cent of project.		
Irrigated, but not cropped.....	1,990	Total irrigable area farms reported.....	24,990.6	363	100		
Total irrigated.....	22,170	Total irrigated area farms reported: Ir- rigated under water-right applications.....	22,172	363	89		
		Total cropped area farms reported.....	20,184	363	81		

pleted. The enlargement of the Chamberino Lateral was completed and the West Side Canal banks raised for 3,500 feet above the heading of this lateral. On the West Side Canal extension the La Union Main section was completed and 2 miles of the La Union East. Contractors completed the Canutillo section. Bucyrus dragline No. 33 resumed operation on the Dona Ana Drain. The Monighan 2T excavator continued on the Del Rio Drain. Three sublaterals were under construction in the Mesilla district, the Gilliam, additional schedule on the Louisiana, and the Lester. One hundred and thirty-nine minor structures were installed on canals and laterals; 14 major structures were under construction. The Montoya Siphon was completed with the exception of back fill. Machine excavation totalled 186,000 cubic yards, 79,000 from drains and 109,400 from canals.

In the El Paso Valley, the Franklin Canal headworks were completed with the exception of installation of gates and accessories. The concrete lining below the headworks to Station 37 was raised to 3 feet above the original section. Some of this had previously been raised 1 foot. Several structures were enlarged in the lower Franklin Canal. The Lee Moor Contracting Co. completed the earthwork on the Salatral Lateral and Government forces completed the Crismore Lateral and enlargement of the Island Main Lateral. Drag-line excavator No. 31 continued on the Playa Lateral construction and excavator No. 34 continued on the Fabens Drain construction. The Jennings Construction & Engineering Co. began excavation of schedule No. 2 of the Tornillo Drain on February 7; 152 minor structures were installed, and work progressed on the construction or enlargement of 14 major structures. Machine excavation totalled 58,000 cubic yards.

Engineer James Munn, of the Denver office, looked over the project while here as a member of the board of engineers reporting on the San Carlos project. This board of consulting engineers consisted of F. W. Hanna, consulting engineer; C. C. Fisher, of Yuma; and James Munn, of Denver.

C. J. Lyman, in charge of payments and collections, of the Washington office, arrived on the project March 22 and spent several days conferring with the presidents of the irrigation districts in regard to accounting systems.

George Pierce, cement expert of the Bureau of Standards, of Denver, Colo., spent several days on the project conferring with the Southwestern Portland Cement Co. in regard to sampling and testing cement, some of which had failed to pass specifications and test. While on the project he inspected the source of sand and gravel used for concrete purposes.

William Bager, chief engineer of the Bucyrus Co., visited the project, making investigation of the operation of drag-line machines.

C. H. Pease, of Raymondsville, Tex., representing the water users of the Lower Rio Grande project, visited this project to confer with District Counsel Dent regarding the proposed legislation for further investigation on the Lower Rio Grande.—*L. M. Latson.*

NORTH DAKOTA PUMPING PROJECT.

The unusual winter weather continued throughout February with, it is believed, the best record North Dakota has ever made for weather.

Repairs to the pumping barge were continued. A feed water line and blow-off line were renewed in

the power plant. During a thaw a small surface cave occurred over the main entry of the coal mine, flooding a considerable portion of the entry. No damage was caused and the inconvenience was overcome as soon as the cave, which was hidden under the snow, was found. New entries were advanced in the mine, and necessary timbers replaced in old entries.

The power plant was operated for the commercial power contract; 93,250 kilowatt-hours of electrical energy were delivered to the city of Williston. This represented a falling off of 4,450 kilowatt-hours from the same month a year ago, which is about normal, inasmuch as the same month last year had 29 days instead of 28. The amount collected for commercial power is \$821.25 more than for the same month last year.

Eight hundred and two tons of coal were mined.—*Wm. S. Arthur.*

UMATILLA PROJECT, OREGON.

February was warm, with an abnormal precipitation. Precipitation for the month was 2.29 inches, the mean for the previous 12 years being 1.1 inches.

Farming operations.—A great deal of hay was shipped out during the month, though the price, averaging from \$9 to \$10.50, was not very satisfactory. Eighty-seven cars of baled and chopped alfalfa hay were marketed.

Labor conditions.—The local supply of labor was much in excess of the need. There is little doubt that this condition will continue throughout the spring. Effective March 1, a new wage scale was announced, as follows: Labor, \$2.80 per day base, \$3.56½ gross; teamsters, 2 horses, \$6 per day; teamsters, 4 horses, \$8.40 per day.

Operation and maintenance.—The feed canal was operated continuously throughout the month; from 49 to 273 second-feet were diverted, of which from 30 to 34 second-feet and from 15 to 239 second-feet were delivered to the Echo Mills and Cold Springs Reservoirs, respectively. On February 14 operation of the feed canal for storage was terminated for the season. A small head was run intermittently throughout the remainder of the month to supply water users and for construction purposes. On February 15 the available storage in Cold Springs Reservoir was 49,700 acre-feet, being within 300 acre-feet of capacity. At the close of the month there were 49,650 acre-feet of available storage. On the East Side one small crew was employed throughout the month on general maintenance work. On the West Side a small crew was employed sluicing on the main canal and on miscellaneous maintenance work. At the close of the month, on both the East and West Divisions, canal cleaning and repair work preparatory to the operation season was in full swing.

Construction.—During the early part of the month a small crew enlarged a short section of Canal A at a point where it passed through a deep rock cut; 286 cubic yards of class 1 and 518 cubic yards of class 3 material were excavated. During the last few days of the month a small force was assembled and work commenced on the replacement of four bridges over the canal, rendered necessary by the enlargement of the canal section. On supplemental construction, District No. 31, 390 linear feet of old 12-inch pipe were relaid and 970 linear feet of 12-inch pipe (new), 1,378 linear feet of 16-inch pipe (new), and 418 linear feet of 20-inch pipe (new) were laid. Several farm turnouts were installed. On supplemental construction, District No. 25, the connection with the M pipe was

constructed, involving the installation of one 10-inch gate valve and two farm turnouts. On the West Side 965 linear feet of 15-inch concrete pipe were laid on lateral 9a.

W. O. Hadley, deputy game warden, visited the project on February 1.—*Maurice D. Scroggs.*

KLAMATH PROJECT, OREGON-CALIFORNIA.

February was warmer than usual and the greater part of the month was cloudy. Most of the streams tributary to the project reservoirs and Tule Lake were in moderate flood during the latter half of the month. The diversion canal was operated at capacity. Water began to spill over the Lost River Diversion Dam on the 12th and continued throughout the month. The maximum discharge was 2,340 cubic feet per second; 23,928 acre-feet entered Tule Lake.

Office studies were continued on the location of the J Canal and lateral system for the Tule Lake lands. Drawings were prepared for the plant layout for constructing the precast units for the new flume on the C Canal.

A crew of 17 men was employed in Camp C in constructing forms for the new flume and in bending steel reinforcement.

About 6,000 acres of the Tule Lake marginal lands are being advertised for lease for the season of 1921, bids to be opened on March 24.—*Herbert D. Newell.*

BELLE FOURCHE PROJECT, SOUTH DAKOTA.

February weather was unusually warm and open. No precipitation occurred and no storms of any consequence, other than strong winds. Roads were in fine shape and have been nearly all winter.

The Diversion Canal was run continuously throughout the month with an average flow of about 150 second-feet. The flow of the Belle Fourche River

for the month was about 21,000 acre-feet; a little over 40 per cent of the flow was diverted to the reservoir. The total gain in storage for the month amounted to 8,990 acre-feet. No field maintenance was attempted on account of frost in the ground, although the weather was open and warm. The district foremen were kept busy repairing trucks, automobiles, and other equipment.

During the month the office engineer was employed, with one of the operation foremen assisting, on compiling data for the annual history and operation and maintenance report, and in making plans for the replacement of wooden chute drops with concrete.

Labor conditions, as far as supply was concerned, were satisfactory, although there was little work in progress in this section of the country. It is believed that labor will be plentiful at a reasonable figure during the season.

Purchases during the month consisted mainly of small supplies purchased locally. About 19 tons of native hay were purchased at Newell at \$8.91 per ton delivered. Two carloads of tile arrived at Fruitdale from Lovell, Wyo., in about 14 days.

There was no marketing of crops during the month and the price of grain remained about the same as last month. Hay was not selling at all except in small quantities in the stack for local purposes. The price ranged from \$3 to \$6 a ton, depending on location. Continued warm, open weather permitted live stock to come through the winter in fine condition with a small consumption of feed. Some of the sheepmen were beginning to lamb out their herds, and the percentage of increase reported was exceptionally good.

On February 25 Assistant Chief Engineer Charles P. Williams arrived, and while on the project went over the construction program for the coming year with the project manager and the engineer in charge of the work. He also attended the mass meeting of

Irrigated crop report, Belle Fourche project, South Dakota, 1920.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Average per unit of yield.	Total.	Average per acre.
Alfalfa hay.....	26,040	Ton.....	48,734	1.87	\$8.00	\$389,870	\$14.99
Alfalfa seed.....	752	Bushel.....	162	.22	15.00	2,430	3.23
Barley.....	1,695	do.....	25,744	15.19	.45	11,580	6.83
Sugar beets.....	1,103	Ton.....	10,291	9.33	10.50	108,055	97.96
Corn.....	3,272	Bushel.....	62,589	19.12	.73	46,940	14.35
Corn fodder.....	308	Ton.....	460	1.49	5.00	2,300	7.47
Garden.....	134					14,870	111.00
Native hay.....	2,820	Ton.....	2,974	1.06	8.00	23,790	8.43
Oats.....	4,864	Bushel.....	112,022	23.03	.45	50,410	10.37
Pasture.....	8,390					67,130	8.00
Potatoes.....	122	Bushel.....	14,516	119.00	1.25	18,140	148.73
Flax.....	145	do.....	830	5.72	1.25	1,035	7.16
Wheat.....	9,850	do.....	49,815	5.06	1.75	87,170	8.85
Miscellaneous.....	355					8,480	23.90
Total irrigated and cropped.....	59,850	Total and average.....				832,200	13.90

Areas.	Acres.	Farms.	Per cent of project.
Total irrigable area farms reported ¹	77,202	1,024	² 79
Total irrigated area farms reported.....	59,848	858	61
Irrigated under water-right applications.....	59,848	858	61
Total cropped area farms reported.....	59,848		61

¹ Seeded, 3,396 acres.

² Based on 97,916 acres.

the water users' association held in Newell on the afternoon of the 26th for the purpose of discussing the present operation and maintenance costs and the deficits which have accrued since 1908. Mr. Williams left for Denver on the afternoon of February 28.—*B. E. Hayden.*

STRAWBERRY VALLEY PROJECT, UTAH.

February weather was unusually mild and pleasant, with intermittent precipitation especially during the fore part of the month.

Farming operations.—Owing to the favorable weather and lack of extreme cold, spring plowing on the farms was resumed during the month. The open winter was favorable for grazing stock and feeding was practically unnecessary.

Labor conditions.—The scarcity of work has resulted in a plentiful supply of common and skilled labor. The average wage for common labor was about \$3 per day.

Operation and maintenance of storage works.—Work on repairs to Strawberry Tunnel progressed satisfactorily during the month. At station 80, 11 concrete bays and 140 linear feet of reinforced concrete floor were put in.

The crushing plant handled 268 cubic yards of rock, and the mixing plant 67 cubic yards of concrete.

Hydroelectric power plant operations.—The power plant was operated without serious interruption and power was furnished to the towns of Spanish Fork, Payson, Salem, and Springville.

Telephone and transmission lines were operated without trouble. Shipments of exciter turbine repair parts were being received at the power plant.

General.—A tentative agreement was reached between the officials of the Utah State Farm Bureau and the Utah-Idaho Sugar Co. on the price basis of the 1921 sugar beet contracts.

The organization of the Santaquin Irrigation District was proceeding favorably.

J. R. Alexander, district counsel, visited the project from February 9 to 15.—*W. L. Whittemore.*

OKANOGAN PROJECT, WASHINGTON.

The precipitation for February was below normal.

The machinery and equipment repairing was continued throughout the month. The Duck Lake engine was ready to be assembled. Considerable other work was done on other engines. Two men were employed throughout the month in hauling gravel for the the repairs and replacement of small structures on the project. The annual operation and maintenance report was written in rough draft and section plats were practically brought down to date and completed for the project lands. The inflow into the Conconully Reservoir amounted to 365 acre-feet for the month.

The apple market became somewhat stronger during the month and practically all of the apples were packed and were being shipped out as fast as they were sold. The price of hay remained steady and hay was being sold at \$20 per ton in the stack.

The project was visited by Darwin G. Tyree, district counsel, near the last of the month.—*Calvin Casteel.*

YAKIMA PROJECT, WASHINGTON.

The prevailing temperature was about normal, with precipitation above the average. Depth of snow on the ground at the reservoirs at the close of the month

was as follows: Keechelus, 47 inches; Kachess, 25 inches; Cle Elum, 6 inches; Bumping Lake, 41 inches.

Operation and maintenance, Sunnyside division.—During the month gravel riprapping of main canal slopes was practically completed. Repairing of main canal drops was well advanced and sloping of silt berms on main and branch canals was 75 per cent completed. Other maintenance work consisted of repairs to Zillah wasteway and small structures in that vicinity; construction of new concrete chute and stilling basin at mile 6.40; small structure replacements and repairs to telephone lines. Supervision and assistance was given the several pumping plants (irrigation districts) in the annual overhauling and repair of machinery, the greater part of the necessary machine work being handled at the Reclamation Service repair shop at Sunnyside.

Ticton division.—Maintenance work was continued along the main canal, consisting of repairs to telephone line and rock retaining walls on fills; also minor repairs and adjustments to headgate and spillway machinery. On the distribution system the patrolmen were engaged in cutting and grubbing willows on main and sublaterals and cleaning out and widening rock sections on Lateral G in patrol districts 5, 6, and 7. Trenching for installation of 1,600 lineal feet of 24-inch reinforced concrete pipe on Lateral C-3.15 was practically completed by the end of the month by the regular maintenance crew and 10 to 12 farmers. Bad condition of the roads, however, delayed the delivery of materials for laying the pipe.

Storage division.—The reservoir gates at Keechelus and Cle Elum were kept closed during the month. The gates at Kachess were opened on the 26th to control the lake surface and retain storage capacity for the spring run-off. At Bumping Lake the gates were operated to hold the lake surface at about elevation 3,404. Reconstruction of about 5 miles of pole line of the Bumping Lake telephone line was undertaken during the month.

Investigation and surveys, new divisions.—Location of the main canal on the Roza division was discontinued on the 12th and the field party laid off. Test-pit work on the same line was discontinued on the 17th. On the Moxee division one party was employed from the 7th to the 17th taking topography of possible pumping areas above the elevation of gravity distribution. An average force of eight men was employed in the office on profiles and estimates for the main canal of Roza division and upon plans and estimates for the main canal and distribution system of the Moxee division.—*C. E. Crownover.*

RIVERTON PROJECT, WYOMING.

The temperature during February was several degrees above normal. Weather conditions were favorable for construction. There was practically no precipitation. The roads were in bad condition during the middle of the month, but improved rapidly toward the end.

Drag lines Nos. 22 and 23 were operated two shifts throughout the month. These machines excavated from the Wyoming Canal a total of 28,037 cubic yards, of which 5,606 cubic yards were excavated from outside the canal prism. Of the total material moved 13,361 cubic yards were class 1, being a heavy gravel and cobblestones; 7,024 cubic yards were class 2, a hard sandy shale; and 6,652 cubic yards were sandstone requiring blasting. Beginning with February 8, two shifts were employed drilling and blasting sand-

stone. Drag line No. 22 was excavated to grade, the material being principally gravel with about 4 feet of shale in the bottom of the cut, which occasionally required blasting. Drag line No. 23 moved a small quantity of shale, but was excavating sandstone most of the month, working to final grade.

Sufficient signatures were secured to the petition for the organization of the Midvale Irrigation District, and this petition will be presented to the court early in March. The project history for 1920 was nearly completed.—*H. D. Comstock.*

Field and office engineering.—Field work was carried on by two crews, each on the Garland and Frannie Divisions; one crew on the Frannie Division was on work connected with construction and one crew on miscellaneous topographic and right of way surveys. One crew on the Garland Division was engaged on the location of open cut and tunnel lines at the upper end of the Willwood Canal and the location of drainage lines, and the other crew was engaged on topographic surveys for drainage purposes. The work on the wash borings at the Willwood Division and tunnel sites was completed. Office work consisted of the preparation of hydrographic data, drainage investigation studies, preparation of drawings covering the power transmission line, preparation of farm unit plats for the third unit of the Frannie Division, and the preparation of estimates in connection with construction and drainage work.

Construction.—Owing to the favorable weather, construction work continued on the third unit of the Frannie Division and on the power plant at Shoshone Dam the entire month. On the Frannie Division the timber work on the canal flume across Sage Creek was completed and the metal work was also erected. In addition a number of minor timber structures were erected on the lateral system of the third unit.

At Shoshone Dam the excavation of the power-house site was continued and work was begun on driving the power tunnel from the lower portal. Forty-three feet of tunnel were driven during the month. The construction plant is about completed except for placing the cable on the cableway.—*J. S. Longwell.*

SHOSHONE PROJECT, WYOMING.

The unusually mild winter weather continued throughout February. There was little precipitation, and as a result all seasonable work could be prosecuted to advantage.

Water supply.—The Shoshone Reservoir dropped steadily throughout the month by reason of the fact that one of the 42-inch blow-off pipes through the base of the dam was open.

Operation and maintenance.—Owing to the mild weather it was possible to continue riprap work on the canal system and considerable of this work was done. Other maintenance work consisted of making minor repairs to small structures and cleaning willow roots out of one of the tile drains. On the last day of the month work of placing the rock and paving below the drops in the Garland Canal was commenced.

Crops.—The marketing of crops continued slowly. The principal shipments from the project consisted of alfalfa hay, 139 cars; alfalfa meal, 103 cars; wheat, 4 cars; potatoes, 3 cars; honey, 1 car; cattle, 5 cars; and sheep, 2 cars. Owing to the unusually mild weather, field work was being undertaken, some plowing having been done as early as the 12th.

Labor.—The labor situation was satisfactory.

Drainage.—The permanent operating organization was engaged in the repair of the various machines.

INDIAN PROJECTS, MONTANA.

BLACKFEET PROJECT.

February weather was mild, with occasional high winds and one snowstorm.

No field work was attempted. Besides the routine office work the annual feature history and operation and maintenance report were completed. Work on sawing and treating a car of lumber, received in February, for use in small structures on the distribution systems of the project, will be commenced early in March.—*R. M. Snell.*

Summary of employees for February, 1921.

Projects.	Beginning of month.	End of month.	Increase.	Decrease.
Yuma.....	124	139	15	
Orland.....	113	106		7
Grand Valley.....	66	69	3	
Uncompahgre.....	65	101	36	
Boise.....	146	157	11	
Minidoka.....	100	120	20	
Huntley.....	12	35	23	
King Hill.....	37	39	2	
Milk River.....	44	42		2
St. Mary storage.....	114	114		
Sun River.....	52	47		5
Lower Yellowstone.....	23	21		2
North Platte.....	374	353		21
Newlands.....	113	119	6	
Carlsbad.....	78	22		56
Rio Grande.....	1,160	856		304
North Dakota pumping.....	27	25		2
Umatilla.....	28	55	27	
Klamath.....	53	64	11	
Strawberry Valley.....	61	62	1	
Belle Fourche.....	17	24	7	
Okanogan.....	32	28		4
Yakima.....	121	128	7	
Riverton.....	42	44	2	
Shoshone.....	206	244	38	
Denver office.....	83	87	4	
Blackfeet.....	4	4		
Flathead.....	130	130		
Fort Peck.....	11	10		1
Field legal offices.....	24	25	1	
Washington office.....	89	88		1
Unassigned per diem.....	34	33		1
Examiners' force.....	2	2		
Total employees.....	3,485	3,293		
Increase.....			214	
Decrease.....				406
Net decrease.....				192

¹ Half time of 9 used on Blackfeet.

FLATHEAD PROJECT.

At Dry Fork Dam there were placed 16 cubic yards of gravel blanket and 1,396 cubic yards of riprap.

At Pablo Feed Canal excavation progressed from station 1325+00 to 1345+95, a distance of 2,095 feet, involving 13,742 cubic yards of material, of which 7,422 were class 1, 6,000 class 2, and 300 class 3.

At Dry Creek lining, clearing, and grubbing progressed from station 145+00 to 120+00, a distance of 2,500 feet. Excavation amounted to 5,792 cubic yards, of which 3,392 were class 1, 1,800 class 2, and 600 class 3. This work was done between stations 165+00 and 135+00.

All construction was by Government forces.

Prospects for winter wheat were more encouraging than previously reported, and a fair crop is expected. Preparations being made indicated that plowing for spring wheat would commence in the near future.

Weather continued favorable for live stock, and all the stock was in fine condition.—*E. A. Moritz.*

FORT PECK PROJECT.

Excellent weather continued throughout February. Cement was hauled to the site of the siphon on Poplar River West Canal and gravel hauled to the siphon on Poplar River East Canal. The project history for 1920 was completed and farm-unit plats prepared for the Big Muddy Division.

The range was free from snow, and it was not necessary to feed the range stock.—*R. M. Conner.*

GENERAL OFFICES.

Washington office.—Director Davis left for New York on February 13 to attend a meeting of the International Joint Commission in connection with the adjudication of the waters of Milk and St. Mary Rivers. On February 15 he delivered an illustrated lecture on the work of the service before the local society of civil engineers of Providence, R. I. On February 16 and 23 he was again in New York, accompanied by Chief Engineer Weymouth, Electrical Engineer Gaylord, Engineer Banks, and District Counsel Stoutemeyer, for conference with the Idaho Power Co. in connection with power development at American Falls, Idaho.

During the absence of the director the office was in charge of Assistant Director Morris Bien as acting director.

Project Manager R. M. Snell arrived at the Washington office on February 1 in connection with the Indian appropriation bill, and left for Montana on the 23d, after spending a short vacation at his home in Maine.

On February 5 a hearing was held before the Secretary on the petition of the Farmers' Irrigation District, adjoining the North Platte project, requesting the execution by the Secretary of a written declaration to the effect that the readjustment of the district's bonded debt, as outlined in the court decree of September 8, 1920, is a satisfactory compliance with paragraph 8 of the contract of December 12, 1917, between the United States and the district, and the certificate was signed by the Secretary on February 14.

On February 9 a hearing was held before the Secretary on the proposed power development by the Nevada Valleys Power Co. on Truckee River which will conflict with the construction by the Reclamation Service of the proposed Spanish Springs Reservoir, Newlands project. A final conclusion was not reached at the hearing and a further conference was arranged to take place at Denver at a later date.

Project Manager Lytel, Yakima project, and District Counsel Holgate, Portland, Oreg., arrived at the office on February 26 for a conference with officials of the Indian Office on the question of additional stored water for the Yakima Indian Reservation.

During the month 1,242 inquiries from ex-service men concerning opportunities on the land were received and answered. Up to the end of the month a total of 181,563 such inquiries had been received.

Among the letters sent to the Secretary for approval were the following:

February 7, recommending, in view of financial difficulties, that, for the present year only, and upon formal acceptance by the water users' association, water be furnished to water users of the Uncompahgre project without advance payment, one-half to be pay-

able July 1 and the other half October 1, 1921, subject to payment of interest and penalties under the contract and regulations; approved February 9.

February 8, relative to the request of E. A. Bolton and the Churchill Company that the gates in Klamath Straits be opened to prevent destruction by fire of about 6,000 acres of land adjoining Lower Klamath Lake in California, recommending that any provision deemed necessary for the patrol of the marsh lands for protection against fire be carried on the United States at its expense; that gates in Klamath Straits be not opened; and that there appears no need of a hearing requested by Mr. Bolton; approved February 12.

February 9, recommending approval, as to form, of draft of contract with the El Paso County Water Improvement District No. 1, Rio Grande project, providing for the collection by the district of operation and maintenance charges for the irrigation season of 1921; approved February 11.

February 9, recommending approval, as to form, of draft of contract with the Fort Belknap Irrigation District, Zurich Irrigation District, and Alfalfa Valley Irrigation District, Milk River project, providing for reconstruction and extension of the Fort Belknap Canal and lateral system; approved February 11.

February 10, reporting favorably on the bill, H. R. 15990, providing for the disposal of certain waste and drainage water from the Rio Grande project, without guaranteeing delivery; signed February 21.

February 14, recommending approval, as to form, of draft of contract with the landowners and irrigation districts, North Platte project, providing for a method of contributing to the expense of a drainage system on Winters Creek Basin; approved February 15.

February 15, transmitting a certificate to the effect that the cost of the drainage system in the Pioneer Irrigation District, Boise project, amounts to \$297,231.38, said certificate to be filed with the district in accordance with the terms of the contract; signed February 21.

February 15, reporting favorably on the bill S. 4931, authorizing the Secretary to reconvey real property donated for use in connection with Federal irrigation projects; signed February 21.

February 17, recommending that the Service be authorized to enter into a contract with the Great Northern Railway Co. for the purchase of water from Milk River project, the company to be charged the estimated operation and maintenance charges plus 50 per cent; approved February 18.

February 17, recommending that authority be granted to approve a contract with the Wones Mortgage Loan Corporation for the purchase of land in American Falls, Idaho, and an office building at the appraised value of \$17,000; approved February 21.

February 18, recommending that Project Manager Barry Dibble, Minidoka project, be designated as the representative and agent of the Secretary, with the authority to vote the rights of the Secretary, at an election on March 7 of a watermaster to be in charge of the distribution of water from the Snake River during the irrigation season of 1921; approved February 21.

February 19, recommending extension of time of payment of construction charge, Salt River project, due December 1, 1920, and heretofore extended to March 1, 1921, to November 1, 1921, subject to penalties fixed by the extension act; approved February 21.

Letters were also approved by the Secretary announcing water charges on the Rio Grande, Huntley, Uncompahgre, Boise, Strawberry Valley, Shoshone, Tieton, Grand Valley, Minidoka, Sun River, and Newlands projects.

Among the visitors to the Washington office during the month were the following: Sir William Hearst, member of the International Joint Commission, and E. F. Drake, director of the Canadian Reclamation Service; Maj. Burgess, of El Paso; B. C. Donhan and L. L. Raymond, of the Tri-State Irrigation District; D. W. Aupperle, of the Grand Valley project; J. C. Stevens, engineer, Portland, Oreg.; Farwell Morris, former president of the Sunnyside Water Users' Association, Yakima project; L. H. Taylor, former project engineer of the Truckee-Carson (now Newlands) project; George E. Brimmer, Rawlins, Wyo., in connection with a proposed project near Encampment, Wyo.; Jerome G. Locke, Livingston, Mont.

Reclamation fund transactions.

[Taken from the Washington office books for the month of February, 1921.]

Balance of funds (report Jan. 31, 1921)-----	\$1, 156, 990. 26
Sales of public lands-----	151, 646. 99
Proceeds under oil-leasing act-----	79, 057. 51
Potassium royalties-----	1, 370. 50
Deposits by special fiscal agents-----	574, 521. 68
Auditor's collections-----	748. 22

Total credits----- 1, 964, 335. 16

Withdrawals:

Advances to special fiscal agents-----	781, 500. 00
Auditor's settlements (disbursements)-----	62, 835. 16

Total withdrawals----- 844, 335. 16

Balance-----	1, 120, 000. 00
Balances with special fiscal agents-----	634, 304. 06
January land sales available Mar. 1-----	80, 813. 66
Proceeds oil-leasing act, available Mar. 31-----	253, 737. 09
Sale of public lands (February) available Apr. 1-----	150, 000. 00

Total estimated funds----- 2, 238, 854. 81

Schedule of balances as shown on Treasury Department books Mar. 12, 1921.

Reclamation fund-----	\$422, 000. 00
Yuma Auxiliary fund-----	293, 560. 79
Blackfeet, 1919-----	6, 443. 20
Blackfeet, 1920-----	1, 829. 02
Blackfeet, 1921-----	9, 188. 02
Fort Peck, 1919-----	36, 803. 93
Fort Peck, 1920-----	2, 135. 70
Fort Peck, 1921-----	5, 382. 51
Flathead-----	5, 554. 39
Riverton, 1919-----	2, 241. 36
Riverton, 1920-----	175. 55
Riverton, 1921-----	-----

Denver office.—The chief engineer left Denver for Washington, D. C., on February 7. He was in New York from the 15th to 17th, and again from the 23d to 26th, in connection with negotiations with the Idaho Power Co. relative to power development at American Falls. Assistant Chief Engineer Walter was in the Denver office the entire month. Assistant Chief Engineer Williams was away from February 24 to the end of the month attending a conference with the Belle Fourche Valley Water Users' Association. Office Engineer L. J. Foster was transferred to the Uncompahgre project as project manager and W. L. Drager was temporarily assigned to the duties of office engineer. Official visitors included Consulting Engineer F. W. Hanna, Project Managers J. S. Longwell, L. J. Foster, J. L. Lytel, Walter Ward, District Counsel J. N. Beardslee and H. L. Holgate, and Engineer F. A. Banks.

In the designing section studies and designs were made for various structures on the Willow Creek Canal, Belle Fourche project; two concrete bridges over the Notus Canal and estimates for Black Canyon Dam, Boise project; concrete lining, Dry Creek Channel, Flathead project; lock-joint concrete pipe lines, King Hill project; cross section and outlet works, Connolly Dam, Milk River project; minor structures for Fort Laramie unit, North Platte project; outlet works, Salmon Lake Dam, Okanogan project; earth work and minor structures, Greenfields and Beale Divisions, Sun River project; outlet, spillway and control works for McKay Reservoir, Umatilla project; concrete and steel outlet tubes and movable crest for spillway, Tieton Dam, Yakima project; transitions, two flumes and minor structures, and preliminary and alternative designs partially completed for turnout and division basins for First Mesa division pipe lines. Yuma Auxiliary project. Preliminary designs and estimates were made for Juniper and Flaming Gorge Reservoirs, also complete tracings of field topography sheets, Bullshead and Black Canyon Dam and Reservoir sites, Colorado River storage project. Advertisements and specifications were prepared for construction of Lower Lost River Diversion Dam, Klamath project, hand-wheel gate lifts Rio Grande project, and for the purchase of two one-half yard buckets for handling concrete, Yuma Auxiliary project. Work was continued on the standardization drawings in connection with reinforcing steel and the design of standard lock joint concrete pipe and forms.

The principal work accomplished in the electrical division consisted of studies relative to the design and specifications for electrical equipment for the Hillcrest pumping division, Boise project; estimates for a 5-ton traveling crane, Huntley project; estimates for 10-inch pumping unit for use in connection with the drainage of the Ryan Sump, Klamath project; detail designs for power plant and emergency valve installation for tunnel, penstock and manifolds, Shoshone project; designs for the B Lift pumping plant, Yuma Auxiliary project. Studies were also made of the proposed installation of a pumping plant for furnishing water to the LL Canal, Lower Yellowstone project, and a complete report made of the power and pumping system for the North Dakota pumping project. Specifications were issued and purchase made of two additional well pumps for the Dutch Flat wells, North Platte project. Detail drawings were begun for the general layout of the Robinson Flat substation, Okanogan project. Specifications were prepared for new penstocks for the two lower 60-inch balanced valves in the Elephant Butte Dam, Rio Grande project.

An amendment to the irrigation district laws of Wyoming was drafted and same was introduced by Senator Nelson, of Powell. District Counsel Roddis appeared before the Irrigation District Committee of the Lower House of the Colorado legislature and explained certain features of the pending bill drafted by the State finance commission and at the request of the chairman of the committee some minor amendments were made. Conference was had with District Counsel Holgate relative to many matters pending within his district and with Project Manager Lytel. This office made recommendation in connection with suit of the Farmers' Irrigation District v. the Bondholders North Platte project. Report was made on revision of contracts with Boise-Mora, Hillcrest, and Emmett Irrigation Districts.

ADMINISTRATIVE ORGANIZATION.

DEPARTMENT OF THE INTERIOR.

Hon. ALBERT B. FALL, Secretary of the Interior.
 EDWARD C. FINNEY, First assistant Secretary.
 SELDEN G. HOPKINS, Assistant Secretary.
 CHARLES D. MAHAFFIE, Solicitor for the Interior Department.
 CHARLES V. SAFFORD, Administrative Assistant to the Secretary.
 CHARLES W. NESTLER, Assistant to the Secretary.
 HARRY G. CLUNN, Private Secretary to the Secretary.
 JOHN HARVEY, Chief Clerk and Superintendent of Buildings.

U. S. RECLAMATION SERVICE.

WASHINGTON, D. C.

Arthur Powell Davis, director; Morris Blen, assistant director; Ottomar Hamel, chief counsel; J. B. Beadle, director's assistant; C. J. Blanchard, statistician; Hugh A. Brown, editor and office assistant; C. A. Blissell, engineer; A. H. Gullickson, chief accountant; Miss H. A. Fellows and Raymond Depue, fiscal agents; C. H. Fitch, chief clerk; Emmet Carr, purchasing agent; G. W. Numbers, appointment clerk; H. N. Bickel, Yakima, Wash., W. A. Meyer, Denver, Colo., and W. F. Kubach, Great Falls, Mont., examiners of accounts.

DENVER, COLO.

F. E. Weymouth, chief engineer, Tramway Building, Denver, Colo.; R. F. Walter and C. P. Williams, assistant chief engineers; Miss L. H. Meisel, secretary to the chief engineer; J. M. Gaylord, electrical engineer; J. L. Savage, designing engineer; James Munn, consulting engineer; J. L. Burkholder, drainage engineer; J. M. Luney, chief clerk; A. McD. Brooks, purchasing agent; Harry Caden, special fiscal agent.

FIELD LEGAL OFFICES.

Boise, Idaho.—B. E. Stoutemyer, district counsel. Projects: Boise, Minidoka, King Hill, and Jackson Lake Enlargement; R. M. Patrick, district counsel located at American Falls, Idaho.

Denver, Colo.—Law section office of chief engineer: E. E. Roddis and Armand Offutt, district counsel; J. J. Buck, assistant district counsel.

El Paso, Tex.—P. W. Dent, district counsel. Projects: Rio Grande, Carlsbad, and Hondo.

Helena, Mont.—W. J. Eggleston, district counsel, Helena, Mont. Projects: Blackfeet, Flathead, Fort Peck, Huntley, Milk River, St. Mary Storage, Sun River, North Dakota Pumping, Lower Yellowstone, and Shoshone.

Mitchell, Nebr.—J. N. Beardslee, district counsel. Projects: North Platte and Belle Fourche.

Montrose, Colo.—J. R. Alexander, district counsel. Projects: Grand Valley, Uncompahgre Valley, and Strawberry Valley.

Portland, Oreg.—H. L. Holgate and D. G. Tyree, district counsel. Projects: Yakima, Okanogan, Umatilla, and Klamath.

San Francisco, Calif.—Henry A. Cox and A. B. Fullerton, district counsel, 349 Pacific Building. Projects: Salt River, Yuma, Orland, and Newlands.

PROJECT ORGANIZATION.

Belle Fourche Project.—B. E. Hayden, project manager, Newell, S. Dak.; R. C. Walber, chief clerk; August Lewin, fiscal agent.

Boise Project.—J. B. Bond, project manager, Boise, Idaho; E. R. Mills, chief clerk; C. F. Weinkauf, fiscal agent.

Carlsbad Project.—L. E. Foster, project manager, Carlsbad, N. Mex.; V. L. Minter, chief clerk and fiscal agent.

Grand Valley Project.—S. O. Harper, project manager, Grand Junction, Colo.; A. W. Walker, engineer; G. H. Murphy, chief clerk; A. H. Hall, fiscal agent.

Huntley Project.—W. M. Green, project manager, Balfantine, Mont.; G. H. Bolt, chief clerk; Miss M. C. Simek, fiscal agent.

King Hill Project.—Walter Ward, project manager, King Hill, Idaho; T. W. Hause, chief clerk; L. D. Eakin, fiscal agent.

Klamath Project.—H. D. Newell, project manager, Klamath Falls, Oreg.; N. G. Wheeler, chief clerk; G. R. Barnhart, fiscal agent.

Lower Yellowstone Project.—L. H. Mitchell, project manager, Savage, Mont.; C. A. Denman, chief clerk; Miss Ruth Lundin, fiscal agent.

Milk River Project.—G. E. Stratton, project manager, Malta, Mont.; E. E. Chabot, chief clerk; G. S. Moore, fiscal agent.

Minidoka Project.—Barry Dibble, project manager, Burley, Idaho; Dana Templin, engineer; E. C. Diehl, chief clerk; Miss A. J. Larson, fiscal agent; F. A. Banks, engineer, American Falls, Idaho.

Newlands Project.—J. F. Richardson, project manager, Fallon, Nev.; G. B. Snow, chief clerk and fiscal agent.

North Dakota Pumping Project.—W. S. Arthur, project manager and chief clerk, Williston, N. Dak.; H. C. Melaa, fiscal agent.

North Platte Project.—Andrew Weiss, project manager, Mitchell, Nebr.; H. W. Bashore, engineer, Fort Laramie Unit; Paul Roth, irrigation manager; J. R. Ummel, chief clerk; Miss A. L. Perrine, fiscal agent.

Okanogan Project.—Calvin Casteel, project manager, Okanogan, Wash.; W. D. Funk, chief clerk and fiscal agent; H. J. Gault, engineer, Conconully, Wash.

Orland Project.—A. N. Burch, project manager, Orland, Calif.; E. T. Eriksen, engineer; C. H. Lillingston, chief clerk and fiscal agent.

Rio Grande Project.—L. M. Lawson, project manager, El Paso, Tex.; T. W. Parry, irrigation manager; C. A. Peavey, chief clerk; L. S. Kennicott, fiscal agent.

Riverton Project.—H. D. Comstock, project manager, Riverton, Wyo.; R. M. Conner, engineer; G. H. Baird, chief clerk; J. C. Thrallkill, fiscal agent.

St. Mary Storage Unit.—R. M. Snell, project manager, Browning, Mont.; F. H. Shlner, chief clerk; H. E. Bruce, fiscal agent.

Salt River Project.—Being operated by the Salt River Valley Water Users' Association; C. C. Cragin, general superintendent and chief engineer, Phoenix, Ariz.

Shoshone Project.—J. S. Longwell, project manager, Powell, Wyo.; J. R. Iakisch, engineer; C. M. Jump, superintendent of irrigation; W. F. Sha, chief clerk; L. H. Kilne, fiscal agent.

Strawberry Valley Project.—W. L. Whittemore, acting project manager, Provo, Utah; J. E. Overlade, chief clerk and fiscal agent.

Sun River Project.—G. O. Sanford, project manager, Great Falls, Mont.; H. W. Johnson, chief clerk; Miss M. G. Valentine, fiscal agent; G. A. Benjamin, irrigation manager, Fairfield, Mont.

Umatilla Project.—H. M. Schilling, project manager, Hermiston, Oreg.; M. D. Scroggs, superintendent of irrigation; G. C. Patterson, chief clerk and fiscal agent.

Uncompahgre Project.—L. J. Foster, project manager, Montrose, Colo.; A. H. Peach, chief clerk and fiscal agent.

Yakima Project.—J. L. Lytel, project manager, Yakima, Wash.; C. E. Crownover and C. F. Gleason, engineers; R. K. Cunningham, chief clerk; J. C. Gawler, fiscal agent; J. G. Hein, engineer, Sunnyside, Wash.; J. S. Moore, superintendent of irrigation, Naches, Wash.

Yuma Project.—P. J. Preston, project manager, Yuma, Ariz.; R. M. Priest, superintendent of construction; E. R. Schepplmann, chief clerk; E. M. Phillebaum, fiscal agent.

INDIAN PROJECTS.

Blackfeet Project.—R. M. Snell, project manager, Browning, Mont.; F. H. Shlner, chief clerk and fiscal agent.

Flathead Project.—C. J. Moody, acting project manager, St. Ignatius, Mont.; C. J. Moody, engineer; J. M. Swan, chief clerk; J. P. Siebenicher, fiscal agent.

Fort Peck Project.—S. A. Kerr, project manager, Poplar, Mont.; Henry Berryhill, chief clerk and fiscal agent.

WORK AND SAVE. BUY GOVERNMENT SECURITIES.



HOMES ON THE LOWER YELLOWSTONE PROJECT.

1. Home of Geo. Pintler, one of the directors of Irrigation District No. 2; N. Dak. 2. Home of John Mohrher, near Fairview. 3. Home of Lars Pederson, about 2 miles north of Sidney. 4. House and dairy barn on holding of Nils Hingstad in the Midway community. 5. Home of Joseph Brockway, 2 miles south of Fairview. 6. Home of Dwight Howard, near Crane. 7. Farm buildings of Wingate Bros., about 3 miles south of Sidney. 8. Bungalow on Albert Swenson's farm, 1½ miles from Fairview. 9. Bungalow on farm of Albert Obergfell, about 3 miles from Fairview. 10. Farm buildings on holding of William Noteboom, about 3 miles from Fairview.

The Reclamation Record

ISSUED MONTHLY BY THE RECLAMATION SERVICE
DEPARTMENT OF THE INTERIOR, WASHINGTON, D. C.

Better Farming : Better Business : Better Living

THERE CAN BE NO SURER INSURANCE FOR THE NATION THAN TO PUT ITS MEN UPON THE SOIL

VOLUME 12, No. 5

PRICE { FREE TO OUR WATER USERS
(SEVENTY-FIVE CENTS A YEAR TO OTHERS

MAY, 1921



THE DESERT'S RESPONSE TO ARBORICULTURE

A SAGEBRUSH WASTE IN 1907. THE HOME OF A. C. DEMARY, MINIDOKA PROJECT, IDAHO,
IS TYPICAL OF THOUSANDS OF PROJECT HOMES WHICH ARTISTIC PLANTING HAS TRANS-
FORMED INTO BEAUTIFUL AND RESTFUL ABIDING PLACES.



EMPLOYEES, SUNNYSIDE DIVISION HEADQUARTERS, YAKIMA PROJECT, WASH.

Left to right: Mrs. Carrie M. Edwards, record clerk; Dominick L. Carmody, assistant engineer; John G. Heinz, assistant manager; Grace L. Adams, telephone operator; B. G. James, levelman; Mrs. Ella S. Tuttle, field clerk; J. F. Anderson, storehouse clerk; J. H. Remington, rodman; S. H. Taylor, junior clerk; Charles H. Langford, clerk; Munson J. Dowd, assistant engineer; Paul L. Parmelee, rodman.



EMPLOYEES, TIETON DIVISION HEADQUARTERS, YAKIMA PROJECT, WASH.

Left to right: Ralph Nazum, junior clerk; Clifford Kali, water master; John S. Moore, superintendent of irrigation; Pearl Hans, recorder.

IRRIGATION HAS HELPED MATERIALLY TO PRODUCE THESE RESULTS.

Milk River Project, Distribution Division, Mont.

By Geo. E. Stratton, Project Manager.

OWING to the fact that the Milk River Project is surrounded by an enormous area of dry-farmed country it is impossible to segregate some of the statistics to apply solely to the project limits. For instance, the statistics concerning shipments of agricultural products and wholesale purchases and manufacturers necessarily include dry land as well as project service.

YEAR OF 1920.

Values created.

(Exclusive of Chinook Division.)

Value of farm lands and improvements on project estimated by the owners at close of 1920.....	\$1,841,000
Value of irrigable land unoccupied.....	1,134,000
Value of livestock.....	522,000
Value of farm equipment.....	172,000
Total.....	3,669,000

Assessed valuations.

(Exclusive of Chinook Division.)

Farms.....	\$579,000
Irrigable land unoccupied.....	451,000
Towns.....	1,809,000
Public utilities.....	2,510,000
Total.....	3,349,000

Value of crops produced in 1920.

	Dry farmed.	Farmed under irrigation.
Exclusive of Chinook Division:		
Alfalfa.....	\$11,000	\$92,000
Corn.....	5,000	5,000
Flax.....	.....	6,000
Hay (other than alfalfa).....	16,000	141,000
Oats.....	6,000	18,000
Pasture.....	24,000	.....
Potatoes.....	4,000	19,000
Wheat.....	30,000	45,000
Miscellaneous.....	6,000	7,000
Total.....	102,000	333,000
Chinook Division.....	.....	427,000
Total for project.....	102,000	760,000
Value of crops produced since 1915 (actual census), exclusive of Chinook Division.....	439,000	1,672,000
Value of crops, Chinook Division, 1919 and 1920.....	.....	792,000
Total.....	439,000	2,464,000

Shipments of agricultural products, 1920.¹

(Exclusive of Chinook Division.)

	Cars.
Hay.....	200
Flax.....	25
Cattle.....	460
Horses.....	200
Sheep.....	140
Wheat.....	390
Oats.....	10
Flour.....	110
Miscellaneous.....	50
Total.....	1,585

Wholesale purchases of manufactures during 1920.¹

(Exclusive of Chinook Division.)

Dry goods, clothing, shoes.....	\$480,000
Lumber.....	290,000
Automobiles, trucks, etc.....	405,000
Groceries.....	990,000
Hardware.....	221,000
Coal, feed, flour, and bags.....	648,000
Farm implements.....	114,000
Machinery and supplies.....	20,000
Electrical supplies.....	8,000
Jewelry and miscellaneous instruments.....	30,000
Drugs and sundries.....	101,000
Cigars, etc.....	24,000
Furniture.....	33,000
Other merchandise.....	98,000
Total.....	3,462,000

Other significant statistics, 1920.

Number of farms.....	260
Number of towns.....	² 11
Population.....	7,800
Acres supplied with water.....	24,332
Acres in crop.....	22,332
Public schools.....	20
Churches.....	22
Newspapers.....	10
Banks.....	² 22
Capital stock.....	² \$805,000
Deposits.....	² ³ \$5,250,000
Number of depositors.....	² ³ 18,000
Industries:	
Creameries.....	1
Flour mills.....	1
Planing mills.....	1
Soft drinks.....	1
Railroads..... miles..	102

¹ Includes dry-land area surrounding the project.² Including Chinook Division.³ Deposits are received from a large area not included in the project.

DAIRYING BRINGS STEADY INCOME TO RECLAMATION FARMERS.

By the U. S. Department of Agriculture, Washington, D. C.

THE sudden drop in prices of many farm crops in reclamation regions the past season has led to a serious consideration of dairying as a steady industry. Dairying seems to some a tedious business because it requires continuous effort day after day, and is not flexible in the way of expanding or contracting the output with the varying demand. Many reclamationists sold off their stock when other lines of farming seemed to promise quicker and larger returns. In the Salt River Valley in Arizona, for instance, the number of milch cows decreased from 40,000 in 1917 to less than 10,000 in 1920. They are now attempting to build up their herds as best they can and are determined to see the proposition through, no matter if some years offer less profit than might be gained by devoting all their resources and energy to annual crops.

While the prices of many crops soared in 1919 butter and cheese held closer to the normal levels and the high prices of feed and scarcity of labor made dairying seem a less profitable proposition. Nevertheless, when the bottom dropped out of the crop markets the farmer found that good old bossy had kept up her per capita income in much greater proportion and was in a position to utilize low-priced feed and turn it into butter fat and other dairy products that brought a ready and lucrative return. Replacing the cattle which were sold off in 1918 and 1919 is a serious proposition, especially with the increased freight rates and the dangers of introducing disease when cattle are brought in in large numbers.

BUILDING UP A HERD REQUIRES TIME.

A dairy herd is something which must be built up gradually to get the best results. The dairyman to be successful must decide to carry his enterprise over year after year. Most of the reclamation projects are too far from the big centers to permit shipping hay, alfalfa, and other heavy crops at a profit, but these crops can be parceled out to the faithful cow and turned into rich milk which, in turn, can be transported to the neighboring cheese factory or the cream separated and sent to a creamery, and the transportation of the locally manufactured product involves less expense.

The keeping of cows maintains the fertility of the land, and the skim milk is a valuable factor in the raising of young stock for meat or for dairy purposes. Extension workers of the United States Department of Agriculture have been devoting much time and effort to assist reclamation farmers to develop an extensive and profitable dairy industry. One of the most important means employed is the better-sires movement.

The introduction of purebred sires has aided in the improvement of milk and butterfat production in herds more rapidly and at less expense than could have been done if an attempt had been made to procure all purebred animals. The latter plan would have been impossible for a majority of farmers who, on the other hand, are able to avail themselves of herd improvement on the better-sires plan. The co-operative bull associations, of which there are 12 in the reclamation area, have also been instrumental in improving dairy cattle by making it possible for dairy-men to purchase good purebred bulls cooperatively at a small cost to each association member. Cow-testing associations distributed through the entire reclamation region have enabled farmers to select the best-producing animals, bringing up their production, and resulting in economy in feed and other expenses.

One such association was formed in Gooding, Idaho, with about 30 members and less than 300 cows. After a year's work a canvass was made of the members of the association, and each was asked to estimate the value of the year's work to himself and his herd. The total of their estimates was \$7,000. The expense of operating the association was only about \$1,500. These Gooding people organized for a second year, and there were so many who wanted their cows tested that it has been necessary to hire a second tester. What is more, the testing association has stirred up interest in dairying, and now they are in the market for grade and purebred cows, a bull association has been formed, and purebred bulls are much in demand.

INCREASED PRODUCTION THROUGH TESTING COWS.

In the adjoining county of Twin Falls a cow-testing association has been in operation for a longer period. Last year the Twin Falls association had 234 cows and the Gooding association 235. Cows of the older association produced 66,622 pounds of butter fat and the new association 49,332 pounds, a difference of more than 17,000 pounds. The difference in gross returns was \$10,660. Department specialists believe that the great difference was caused by the testing association having been in operation longer in Twin Falls County.

That there are so few cow-testing associations in the West is lamentable in the face of figures which show their great value. Denmark has about 700 cow-testing associations and about one-third of all her cows are under test. Her milk cows produce nearly double what our milk cows produce. This is believed to be the chief reason why she is able to undersell us on dairy products. Department officials believe we can beat her at her own game, as some of our western

associations have better butter-fat averages than any of hers. The only difference is in the number of associations. There are almost 2,000,000 dairy cows in the 11 Western States, almost twice as many as in the whole of Denmark, yet we have only about 50 cow-testing associations.



Upper: The beginning of a dairy herd; Holstein calves, Boise project, Idaho. Middle: Cows which will mean much to reclamation project dairying; Uncompahgre project, Colorado. Lower: Farmers' cooperative cheese factory, Minidoka project, Idaho, organized and opened in 1915.

For the dairy industry to reach maximum efficiency in the reclamation regions, it is essential that creameries and cheese factories be placed at convenient locations to take care of milk or cream and manufacture it into butter and cheese, because a large proportion of the products are at such a distance from big marketing centers that raw-milk shipments are impracticable. Cooperative cheese factories and creameries have proved successful in scores of localities, and it is desirable that others be established.

A cheese factory can do business with a patronage from 300 cows, and that number can be found in most cases within a short enough radius of some central point to permit daily hauling of the product. Where motor trucks can be used throughout the cheese-making season the factory radius can be made larger than where farmers are dependent upon horse-drawn wagons. Cooperative hauling by motor truck is practiced in all parts of the country, and commercial hauling has also been found practicable. Creameries can serve a larger territory than cheese factories, because

the cream is customarily separated on the farm and leaves less bulk to be transported.

CREAMERY IN IDAHO SHOWS LARGE GROWTH.

One of the most successful cooperative creameries in the reclamation territory is at Payette, Idaho, and it has been a leading factor in building up an enviable dairying industry in connection with the alfalfa and fruit raising which has done so much to develop Payette County. This creamery started in 1915, when dairying in that locality was in a very elementary stage.

The Farmers' Cooperative Creamery Co. began business in a shed with one employee and a patronage embracing 300 cows. Its manager early realized that much better results could be obtained by improving the herds and an intensive campaign was undertaken for the purchase of pure-bred sires. The success of the more enterprising dairymen brought others into the field, and the creamery in 1919 had 1,160 patrons owning approximately 4,000 cows. The expansion of the business required the construction of a new modern creamery building costing \$17,000. The association now has property valued at \$30,000 and employs 15 people. Its butter production grew from 200,000 pounds in 1916 to 611,000 pounds in 1919, and its ice-cream production from 2,000 gallons to 17,000 gallons in the same period. The creamery established a brand and produced such a superior article of butter as to command highest prices in the Chicago, New York, and Pacific coast markets.

Its success is only one of the examples of what can be done in any ordinary reclamation district if a few enterprising residents will take the lead. The matter of prime importance in the present state of the dairy industry, with the herds reduced in many localities because of diversion of energy to growing cash crops, is to build up the number and quality of the milk cows. Particular attention should be given to the breeding and rearing of calves, and the best quality of sires should be employed to insure high producers.

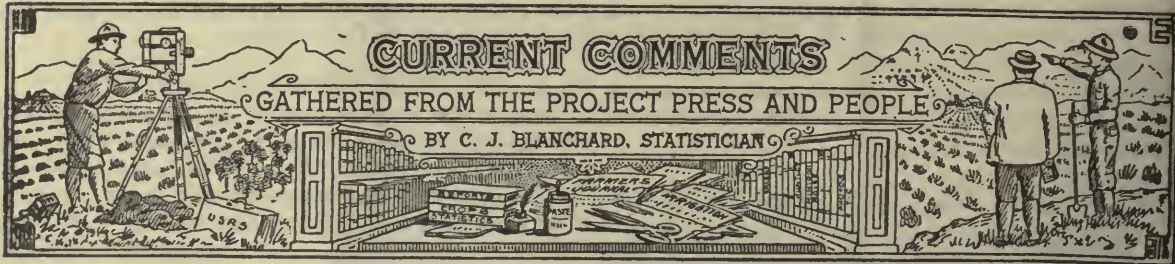
The Department of Agriculture has a number of available publications for the assistance of those wishing to develop dairy herds, and direct assistance can be obtained by applying to the county agent or to the Dairy Division, Bureau of Animal Industry, Washington, D. C., direct.

BULLETINS FOR THE FARMER.

Distributed by the Department of Agriculture,
Washington, D. C.

FARMERS' BULLETINS.

- No.
1155. Diseases of sheep.
1181. Raising sheep on temporary pastures.
1193. The beet leaf-beetle and its control.
1194. Operating a home heating plant.



IN the February issue of the RECORD we published a letter from a citizen on one of our projects, in which he advocated a rather revolutionary method of solving some of our land problems. Owing to a similarity in initials we ascribed the letter to a friend who has achieved success as a farmer, merchant, and banker, and expressed our surprise at his doctrine. Now comes our friend with a protest saying we have made a mistake in the identity of the author. So to put him right and make due amends we hereby declare that Mr. J. S. Dowling, of the Shoshone project, was not the author of the letter referred to.

Reports from many projects indicate a bumper crop of alfalfa in 1921, and there is some concern as to the prices for hay. With the live-stock industry in the West at the lowest ebb for years the question is not easy to answer. On several projects the alfalfa meal mill is being considered. Last season we noticed several portable mills in operation on the Newlands project. The machinery operated by a tractor was hauled to the stacks and set in operation grinding the hay into meal. We have not been advised as to the financial success of the scheme, but the facts doubtless could be ascertained by writing to the project manager at Fallon, Nev.

On most of our projects spring time came early and the farmers are well advanced in their operations. An abundant water supply seems assured with reservoirs full and a considerable snow fall in the mountains. The labor supply is abundant, and wages are lower. There is more cheerfulness among the farmers than existed a month ago, and a big harvest next fall is predicted.

On many of the projects the local farm bureaus are organizing the farmers to secure better marketing facilities. The meetings are largely attended and there is much enthusiasm.

Everywhere in the West the thinking folks now realize that the increase in land values due to the war had become abnormal, and if continued would have resulted in checking the permanent development of the country. The sales and leases made in 1918, 1919, and 1920 were at prices which even the continuance of war prices could not justify. The severest blow fell on those who bought or rented lands during these years, as most of them made only small advance payments and reckoned on high crop prices to pull

them out of the hole. The slump in market values ruined many of these, and now the farms have gone back to original owners. Many of the latter spent their rents and payments for vacation tours or other things and now find themselves in a poor position to go back to farming.

For those who are looking forward to owning a farm home the present time is propitious. On many projects good lands are below prewar levels and invite buyers with capital. A dollar in hand to-day will buy more land in the West than it would before 1916. It will buy almost as much labor and equipment.

Idaho deservedly has taken front rank in the production of certain seed crops, notably peas, beans, and several clovers. The purity of their seed crops, high germination, and trueness to type have created favorable markets in the Middle West and on the eastern seaboard, where the producers for the big canneries are located. The industry of growing seeds has assumed large proportions and is very profitable. The growers of seed peas in Idaho and Washington therefore will be interested and should be gravely concerned in the warning recently issued to the western growers of peas for canning in the Eastern and Middle States. The warning is to the effect that unscrupulous dealers and some growers are guilty of substituting spurious seed. On 1,700 acres in Maryland and Delaware 30 per cent of the total pea crop was planted with seed that proved to be spurious.

It was found that the objectionable peas came from certain growers in Idaho and Washington, some of whom were honest, but some of the dealers appear to have taken advantage of a threatened shortage in seed peas to perpetrate substitution. There is another variety which is locally known there as Alaska, but which does not have the qualifications desired by the eastern canners. A number of lawsuits have grown out of the situation, but there seems little likelihood of injured parties recovering more than the price paid for the seed, although the damage they sustained was far greater. The dealers' integrity seems to be the only practical protection against repetitions of the same situation.

It appears that prosecution of this fraud on the eastern growers is not in the power of the Department of Agriculture beyond the publication of the names of the guilty ones.

In view of this fact and in order to protect their own interests, it would seem advisable for western seed growers to organize a central selling agency, standardize the product, and eliminate for all time the agencies of distribution which have proven unfaithful to their trust.

Among our numerous callers this month were Gov. Davis and Commissioner of Irrigation Swendsen, of Idaho, who were in Washington several days in conference with department officials. Both were optimistic regarding the future of reclamation in the Gem State.

The Department of the Interior welcomes into its numerous family two well-known westerners, former Gov. William Spry, of Utah, the new Commissioner of the General Land Office, and Hon. C. H. Burke, of South Dakota, who is now in charge of the Office of Indian Affairs. Both are eminently fitted by experience and training for the important duties of their respective positions. These appointments are gratifying to the Service, as the activities of the three bureaus are closely related in many matters.

NOTED HERE AND THERE.

Arizona, Salt River project.—The Chandler banks have been kind enough to back a number of boys who are members of the pig club, and the boys who have thus been helped with a loan are very appreciative of it and intend to do all in their power to make good. Pigs are furnished at \$7.50 per head. These registered pigs are the chance of a lifetime, and any boy or girl who can get the feed can make some money without very much work. The 30 pigs already in the club will be as good as money can buy, and there is no reason why the boys and girls in the Chandler Pig Club can not take all the prizes or at least a good share of them. The favorite strain is Duroc.

Arizona-California, Yuma project.—The general depression among the farmers is fast disappearing, and with completion of spring operations the spirit of optimism is returning. The big crops are cotton, alfalfa, grain, and sorghum, but considerable interest is being taken in truck crops, grapes, dates, pecans, hogs, and dairying. Work is going on rapidly on the Mesa, and it is hoped that everything will be in readiness to plant crops this fall.

Notice was given recently in the RECORD that some 10,000 acres of excess holdings of Yuma farmers must be sold by December 1, 1921. We are informed that farmers are now listing their lands with the Reclamation Service at Yuma, which will assist buyers in locating the farms. Prices on the lands offered show falling off since 1920, but it is believed that present quotations will have to be further reduced, especially on the lands only partly in cultivation. With only a short time in which to conclude sales owners of excess lands should price their lands so that buyers

will be attracted before December 1 of this year. A forced sale of a large number of tracts would depress all values and certainly would give the whole project a setback. Prices based on cotton at \$1 per pound will not bring buyers to-day. Lands which are prepared for or in crop with good improvements and well located may bring \$200 to \$300 per acre, but raw lands will not stand any fancy prices these days. We hope the lists of lands will cover every one of excess holdings and be submitted at once, as we are holding up the circulation of the Yuma pictures until this is done. It should be understood that while the Service is willing to assist in every proper way to interest homeseekers in the opportunities in Yuma Valley, it will not encourage anything tending to exploit the newcomers.

California, Orland project.—Anticipating a large number of auto tourists this year, the Orland Chamber of Commerce has leased a tract of land, and is now preparing it for a camp ground. The property is well shaded, supplied with city water, sewer connections, and electric lights. The hospitality of The Project of No Regrets has been widely heralded in the past by the tourists, and it has paid handsomely, too, as evidenced by the large increase in the number of new families who have taken up their permanent residence in this favored spot.

The Jersey Calf Club of Glenn County was started off with a bang when the Jersey enthusiasts of the county gathered to see the entries in the race which ends with the fair this fall, judged by the committee of three.

The new calf club is considered one of the big steps forward in the dairy industry of the county for it will revive the interest in pure-bred stock and will boost this game throughout the county through the youngsters who have calves entered in the unique contest.

Colorado, Grand Valley project.—There is just one lone desirable Government unit unentered on this project, and this is a reminder to some chap that it's a pretty fair farm. It was cleared and leveled by the Government and a crop was grown on it, so it is ready for another. The applicant must pay the cost of the land preparation before filing will be accepted. Better write the project manager at Grand Junction, Colo., if you are interested.

Colorado, Uncompahgre project.—Local Holsteins are continuing to make good milk and butter production records, as is indicated by the official tests reports from the office of Malcolm H. Gardner, Delavan, Wis., superintendent of advanced registry of the Holstein-Friesian Association of America.

A recent bulletin reports the pure-bred Holstein cow, Pahgre Belle, owned by the Pahgre Valley Ranch, of Montrose, Colo., as having made, at the age of 5 years and 1 month, a record of 562.2 pounds of

milk and 20.101 pounds of butter fat in seven days, equivalent to 25.12 pounds of butter.

Idaho, Boise project.—F. F. Bruins, living near Ustick, sold a large herd of Jersey cows, most of which were registered, to upper Boise Valley owners for more than \$4,000. The average price of the stock sold was \$250.

The prices ranged from \$41 for a 2 months' old heifer calf to \$510 for Fox's Triple Rosebud O. D., a 3-year-old Jersey with a 10,000-pound milk record for 1920 and a record of 540 pounds of butter fat.

The Reclamation Service recently made water-right filings for the American Falls Reservoir and the projects which may receive water from it in the office of State Commissioner of Irrigation at Boise. These filings include an application for reservoir permit of 3,000,000 acre-feet, and diversion permit for 8,000 second-feet. This is the largest water-right filing ever made in the State of Idaho.

Boise farmers, notwithstanding the severe depression in the values of products and stock, have come up to the scratch with a large percentage of the construction and operation and maintenance charges. In one day they paid \$135,000.

Idaho, Minidoka project.—"Taming the Snake," a two-reel scenario which we secured last summer through the cooperation of the Snake River Valley Community Club of Idaho, was shown recently to a very distinguished audience in the caucus room of the House of Representatives, and was received with much favorable comment. Hon. Addison Smith, Representative from Idaho, to whose courtesy we are greatly indebted, arranged the affair and presided as chairman. The big room was comfortably filled, and the audience included a number of Members of Congress and their wives. The reels illustrated graphically the wonderful scenic attractions and the vast resources of the Snake River Valley. Pictures of the American Falls Reservoir and dam site were also exhibited. In addition there were two other reels illustrating the great engineering works of the Service and the agricultural progress on many projects.

It is most pleasing to learn that a \$60,000 canning factory is likely to handle a large acreage planted to peas. The fame of Idaho peas is very wide, and the seed crop of the Minidoka project has long been a favorite among New England growers. Minidoka will can her own if the deal goes through.

After struggling for a generation for its very existence, the Albion State Normal School is to be moved to Burley. The school is to retain its present name. The school will continue at Albion during the regular 1921-22 term and the 1922 summer school and will open in Burley for the fall term of 1922.

The removal of the school to Burley is one of the biggest things that ever came to the city. It was done through recognition of the fact that Burley is

properly located for building up a great educational institution. The value of the school to the individual who has children to educate will be material and direct, while the advantages coming through having such an institution will be felt by every citizen of the community.

Montana, Flathead (Indian) project.—It is stated that a premium of 15 cents a box for Flathead-grown Rome Beauty apples over Wenatchee apples of the same variety was recently paid on the Kansas City market. County Treasurer Oscar Moen shipped a car of Rome Beauty apples from his ranch on the east shore of Flathead Lake. The car arrived in Kansas City at the same time that two cars of Wenatchee apples were received. Buyers looked them over and offered a premium of 5 cents a box for the Flathead apples, later raising it to 15 cents, Mr. Moen getting \$1.10 net. The buyers declared that the Flathead apples were superior in color.

When the Flathead country is better known we anticipate a big rush to that beautiful valley.

Montana, Milk River project.—A publicity campaign to make widely known the advantages of the most northern reclamation project of the Service has been started by the civic associations of the Milk River Valley towns and the colonization department of the Great Northern Railway. The Government is prepared to furnish water to a considerable area of excess lands in private ownership, much of which is not tilled, and options on these lands have been obtained in order to insure fixed prices when settlers appear. The Milk River Valley is an attractive agricultural region with fertile soil and a very smooth topography. The latter makes the cost of land preparation comparatively cheap, and irrigation is simple. Notwithstanding its northern latitude the summer days are exceptionally long, with abundant sunshine, and plant growth is extremely rapid. The principal crops are cereals, hay, and hardy vegetables. Land prices are said to be reasonable.

Montana-North Dakota, Lower Yellowstone project.—It will be welcome news to many of the project farmers in the Yellowstone Valley to learn that Fairfield is to have a large nursery which will supply native-grown trees and shrubs. An experienced nurseryman from Great Falls has cleared ground and is now planting trees and shrubbery. The farmers have long felt the need of arboreal decorations about their ranches, but lacking knowledge and experience in varieties have been slow to tackle the job themselves.

Nevada, Newlands project.—A unique trading proposition is being tried out on the Newlands project. One of the dairymen who is milking 29 cows has entered into an agreement with a big alfalfa grower, whereby it is stipulated that the price of hay shall be governed by the price of butter fat. The experiment is being watched with considerable interest in the valley.

If the observer wants to see some genuine wheels of industry all that needs be done is to make a trip to the big Lahontan Valley Sugar Co.'s plant in the eastern environs of Fallon and take note of the tuning-up of machinery that is now in active progress. These industrial wheels are shortly to convert many thousands of tons of beets from Nevada's farms into the best quality of sugar. The statement, "sugar-beet growing is shortly to become Nevada's leading branch of agriculture," seems a truism at this juncture.

The first consignment of registered Holstein cows arrived recently and were taken to the Wingfield ranch in the Island district, known as the Section, where they will be kept for a couple of weeks until the next shipment arrives.

In this shipment there are 25 cows and 50 2-year-old heifers. It is understood they are all registered Holsteins. Of this first shipment, 25 are now giving milk and the rest will be fresh soon.

The second lot of cows, which will consist of 200 head of registered Holsteins, Durhams, and Jerseys, is on the way.

It is expected that the creamery will be open for business the 15th of May, and by that time there will be a large number of cows added to the dairies of this valley through the movement Mr. Wingfield has started for the bringing in of dairy cows to consume the surplus hay.

The farm bureau of the Island district, together with the trustees, took the matter of school-ground improvement in hand to raise funds to fence grounds and set trees. Thirty dollars in cash was raised by donations and from the proceeds of a dance given at Clark's pavilion. A day was set for the community to turn out, and as evidence of the civic pride of the people of the district every family and farm in the district was represented except a few. H. E. Smith, president of the community center, proved himself an organizer in massing and arranging his forces, Ed Norcutt having delivered posts the previous day. Two crews of men were delegated and started on a pilgrimage early to get trees for planting. Mr. Wingfield very generously agreed to furnish enough woven wire to fence the entire grounds, consisting of 2 acres. Before the noon hour the trees were delivered in good condition, most of the postholes dug, and many posts set.

As is usually the case, men are never able to do anything worth while without the assistance of the ladies, who through their many and united efforts and the generous opening of the bread box arranged a spread at the Island chapel for the entire community. As the work took the crew of men well toward night, the ladies decided to also arrange supper for the crowd, and at 5.30 the crowd was again treated to a feast, making the day one grand all-day picnic as well as a chance for the people to show their civic pride. All in all the day was one grand success, every

one expressing a feeling of satisfaction that they had really accomplished something worth while, and as the years roll on everyone can point to the fine grove of trees with pride and a fond recollection of the good time had. We recall a similar occasion at the organization of the Harmon school district, when 100 farmers came forth, cleared and leveled 10 acres, and set out trees. Our recollection is vivid also of a very delectable feast of fried chicken, green corn, and other delicacies provided by the ladies. That's the Newlands spirit.

Neio Mexico-Texas, Rio Grande project.—Consolidation of the dairy interests in the El Paso Valley with a view of greatly expanding the industry and increasing the profits of the dairymen is being considered. Plans are being formulated to bring about a cooperative organization which will coordinate all the activities of the dairymen. A central delivery and distribution depot is suggested from which the entire product of the valley will be marketed. In addition it is proposed to erect a cheese factory, a condensery, and a creamery. The near-by markets of Texas and New Mexico and the important tributary territory of Old Mexico would readily consume all the dairy products of the valley. It is said that approximately \$100,000 worth of these products pass through El Paso annually from outside districts. Every dollar's worth could be produced in the valley. The dairy industry would do much toward building up the land and result in a big increase in crop yields.

Each month we report some new and important forward step of the Elephant Butte irrigation district. The latest is the decision to purchase a home for the organization, and the McClure Hall in Las Cruces has been selected. The hall will be remodeled into an office building with more than ample room for the needs of the district, and plenty of space for the Reclamation Service, the Farm Bureau, and the numerous cooperative organizations which are functioning here. It is to be a "Temple of Agriculture," centering under one roof all the active bodies in which the farmers are interested. It will help materially to link closely all the operations of these live organizations, and at the same time will assure great economies.

Organized Farming, the monthly publication of the Dona County bureau for March, is a most interesting document. President Brook, in a very clear-cut statement, presents some facts regarding the district's finances and books, and compares the past and present expenses of the association. The showing is most creditable for the present administration. Francis Lester, president State Farm Bureau Federation, clearly sets forth the activities of the federation. The mining industry is discussed by L. B. Bentley. Judge Eylar contributes an interesting article on the Farmers' Problems, and points the way toward solv-

ing many of them. A large number of articles were also contributed by writers of experience, including a historical narrative of the transformation of the Mesilla Valley written by S. S. Hoagland, the managing editor. Articles on farm management, poultry, husbandry, an especially interesting page on community life, and one on the home makers added to the attractiveness of the number. Everything considered the March number is the best Farm Bureau publication which has yet come to our attention.

North Dakota, North Dakota pumping project.—The "Get Together" meeting of the members of the Williston irrigation district recently was a huge success from every point of view. It was called to give an opportunity for all the farmers to express their views on district matters, and a consensus of the opinions was that the district is headed for success. In the general discussion, which followed the reading of reports, every farmer was asked for his opinion as to the value of irrigation. All those who spoke, with the exception of two men, expressed their entire satisfaction, varying only in the degree of enthusiasm. One expressed his feelings in these words: "Any time you stop the water, I stop farming." One declared that he was convinced that 10 acres was all the land he needed under irrigation and that he was willing to sell the rest of his quarter section; others declared their willingness to sell 80 to 120 acres of their holdings, and their belief that the 8,000 acres within the irrigation district could well support 300 more families.

C. D. Greenfield, traveling agricultural development agent of the Great Northern Railway and former commissioner of agriculture of Montana, traced the history of irrigation in Montana and spoke of the various irrigation projects with which he was familiar. He knew of none whose costs were as low

as those in this district and said that after a careful examination of the plant and the entire project he had no hesitancy in saying that it was the best he had seen anywhere, and that if the people here were in any way dissatisfied with it, he wished he could move it to Helena, where he was sure it would be properly appreciated.

Mr. Greenfield said that while the Williston project was the most interesting in the United States, very little was known of it. He was convinced that proper advertising would bring buyers for surplus land and indicated a willingness on the part of his company and his own desire to cooperate to that end.

The following resolution was introduced by Joseph Wegley and was adopted by a unanimous vote:

"Whereas the success of the farms and farmers in the district depends upon economical management and the best efficiency; and

"Whereas the amount paid for labor is the biggest item in operating costs; and

"Whereas the present basis of wages and consequent costs is influenced by an agreement with the miners' union by which wages are paid for labor out of all proportion to the returns from labor on farms or in any nonunion industries in the community: Now, therefore be it

"Resolved, That it is the sense of this meeting that the rates paid for mine labor for the operation of the district irrigation system are intolerable and indefensible and we demand of the United States immediate action looking for the readjustment of the rates for such labor, to the end that all project costs may be reduced and put upon a reasonable footing to bring about the degree of prosperity which we have a right to expect."

A vote of thanks was extended to the ladies for the dinner and to those who assisted in serving.



"Get together" dinner of Williston irrigation district, North Dakota Pumping Project.

Oregon, Umatilla project.—Recognizing the superior quality of products grown on the Umatilla project one of the largest fruit shippers in the United States has erected a big warehouse at Umatilla on the banks of the Columbia. The building is modern in every respect, and has been constructed with permanency in mind. This station is the largest one the fruit company has in the Pacific Northwest, having a capacity of 2,250 heaters. The warehouse is used exclusively for repairing and maintaining charcoal heaters for the fruit cars as they go east loaded with fruit. There are five other stations in this section, but the Umatilla stations is as large as any two of the other warehouses put together. It is 250 feet long by 30 feet wide. Besides the 2,250 heaters, there are several tons of charcoal which will be loaded into the heaters and sent on their way East this winter.

The company will employ 30 men during the shipping season, which starts in September and stops in April. A large siding has been constructed to take care of the trains that will stop there to have the heaters installed before going over the mountains.

Washington, Yakima project.—There was something more to it than just a sale of Berkshire hogs at the D. C. Bunn ranch at Prosser recently, and those who attended came away more convinced than ever before that the Yakima Valley offers the best opportunity in the Union for live-stock breeding. There were buyers from Ohio, California, Oregon, Idaho, and various sections of this State. The sale of 50 head totaled \$3,917.50. Twenty-five head of boars and bred sows averaged \$131.91. Average price per head for the 50, \$78.35. The top boar went to Ralph King, of Cleveland, Ohio, for \$435. The Oregon Agricultural College bought a boar for \$325.

The daughters of Sir Bessie, the well-known Holstein bull owned by H. C. Davis, are setting world's records for their owners; in fact, it is stated that there are only 13 cows having a world's record over 30,000 pounds of milk, and 9 of them were bred in this State. A 2-year-old daughter of Sir Bessie, now owned by the Milky Way Farm, is expected to break all records, according to Holstein men who are daily watching the records.

Wyoming, Shoshone project.—One of our reclamation boys has invented a machine which may prove a great boon to sugar-beet growers. It consists of a coulter with a depth gauge in the nature of a band in the sides of the coulter. This in connection with a pair of knives, and all on a frame similar to a plow, forms the whole machine. The coulter follows directly on the row of beets and splits the crown to a depth of an inch and a half or such matter, regulated by the band on the sides. This is followed by the knives which lap over behind the coulter and cut the whole top. In a demonstration last fall four rows were cut without missing a single top.

"GET ACQUAINTED" WRITE UPS.

Miss Lydia H. Meisel, Denver Office, U. S. Reclamation Service.

The RECORD has published numerous "get acquainted" write ups of mere men—engineers, lawyers, accountants, water users, etc.—and believes that these articles have been more than justified in helping to keep the Reclamation Service what it should be—one big family working enthusiastically and whole-heartedly for the interests of our projects and their development. It is with peculiar pleasure, therefore, that we present to our readers Miss Lydia Meisel, the right-hand man of Chief Engineer Weymouth.



Miss Lydia H. Meisel.

In June, 1915, Miss Meisel was transferred from the General Land Office, Washington, D. C., to the Denver office of the Reclamation Service as a stenographer. She has been Mr. Weymouth's secretary for the past two years, has shown marked ability and judgment, and has filled the difficult position she occupies most satisfactorily. In addition to her other duties, Miss Meisel is the editor of the News Letter, the little mimeographed weekly which has been received so kindly by our employees.



Arboriculture.

D ID you know that Arbor Day is western in its origin? It originated in the fertile brain of one of our most distinguished and honored citizens, the late Hon. J. Sterling Morton, of Nebraska. Before the Civil War he was the owner of a certain barren tract of ground upon which, according to popular belief, not a single tree would grow. But Mr. Morton believed he knew better. He ordered a consignment of trees from the East, planted them, and had the satisfaction of seeing them thrive. He straightway named his home Arbor Lodge, and later, as a member of the Nebraska Legislature, introduced a bill and persuaded that body to set aside a day in April for the planting of trees and shrubs by the citizens.

The early citizens of the Missouri Valley country appreciated much more keenly the importance and need of trees and forests than do the citizens of the present day. They planted orchards and groves and contributed in every way to encourage tree planting. To-day all the States in the Union and most of the civilized nations of the world observe Arbor Day.

The planting of trees along highways, the beautifying of the home, the school grounds, cemeteries, and parks has for years been urged and impressed upon the entire population. Get in the game this year and plant a living shrub or tree that will be a beautiful monument even when you have passed away.

Beautiful grounds need not be expensive. The loveliest flowers and plants that ever grew are found in the woods and along the banks of streams, in fence corners, and in fields and shady nooks. They are yours for the digging. What is rarer or prettier than a bed of wild violets and ferns in a shady spot near

the house? Plant generously of perennials, so that they will bloom and grow year after year with little time and attention and give stability to your landscape effects.

Select them so that you will have blossoms from early spring until late frost. Although the best arrangement of trees and shrubs on large grounds requires the service of a landscape gardener, a few simple hints will serve to prevent the inexperienced person from making serious mistakes. Plant in masses, with the larger shrubs at the back and the smaller ones in front. Leave plenty of open space for a lawn. Avoid straight lines as a rule. Use vines profusely wherever possible, selecting those which are hardy and not seriously affected by pests. In selecting trees consider the matter of litter and the shedding of leaves. Consider also the ultimate size of the trees you plant, and do not put those of large size near the house to exclude the sun and light.

The improvement of home grounds is as contagious as idle gossip, once it is well under way. You have a moral responsibility to add to the attractiveness of your neighborhood.

Get your neighbors interested and divide your plants. In no time you will find yourself the proud possessor of a wonderful collection of such perennials as peonies, phlox, iris, etc., and all kinds of flowering shrubs and vines.

It will add much to the monetary value of your place, if that means anything to you. If you have a successful and up-to-date neighbor you will find that he is a firm believer in the gospel of beauty.

Birds.

Early in March the Washington State Federation of Women's Clubs sent out a letter urging cooperation in bird conservation. This was not received in time for the April RECORD, but May should not be too late, indeed any month in the year is a good time to urge protection, or rather a defensive alliance with the birds, so that when crops need protection against insect enemies we will have a squadron of aerial cavalry to help us repulse the raid.

The letter suggests that when the children are making bird houses in the manual-training rooms, these houses be built to suit the preferences of the birds wanted for neighbors. The house with several compartments and as many openings, for instance, although it gives wider scope to the young carpenter, is not appreciated by the blue bird, which has no use for apartment houses. The blue bird will nest in the simplest kind of a box, though it may be made as ornate as the manual-training worker desires, providing that it has only one room and an entrance just the right size. For a blue bird the opening should be an inch and a half in diameter. On the other hand, if you have the purple martins put up colony houses by all means.

The club women urge special observance of Arbor and Bird Day in school especially. They have saved some very delightful and valuable birds to their State by protesting against the attempt of the Sportsmen's Association to have permission to kill the water ouzel, the blue heron, the crow, hawks, and owls.

The United States Department of Agriculture has issued several interesting booklets on methods of attracting birds which may be had upon request. There is a little book entitled "First Book of Birds of Washington and Oregon," by W. L. Lord, printed by Gill, of Portland, and a larger book which is also helpful called "The Birds of Washington," by Dawson and Bowles. With these books and a pair of field, or even opera, glasses to see the markings, the birds can be identified very easily.

Local libraries should be able to supply suitable books for any section.

Within certain limits birds eat the kind of food that is most accessible, especially when their natural food is scarce or wanting. Thus they sometimes injure the crops of the farmers who have unintentionally destroyed their natural food in his improvement of swamp or pasture. For instance, when berry-bearing shrubs and seed-bearing weeds have been cleared away the birds have no recourse but to attack the cultivated grain or fruit, but the great majority of land birds live almost entirely upon insects, taking vegetable food only when other subsistence fails. It is thus evident that in the course of a year birds destroy an incalculable number of insects, and it is difficult to overestimate the value of their services in this direction.

The farmer should not begrudge them a cherry or two now and then. He feeds his hired man and pays him well for his labor to boot.

Boys and girls will be interested to know that birds winging their way northward this spring will find 175,000 new houses built for them during the past year by members of the 65,000 Audubon clubs scattered over the United States and parts of Canada. Each club member studies the appearances and habits of both songsters and the unmusical types of birds.

The American Forestry Association has published the fact that a cliff swallow will eat 1,000 flies, mosquitoes, wheat midges, or beetles in a day. The crops of four chickadees showed 1,028 eggs of the canker-worm. Take notice, Mr. Fruit Grower. A quail killed in a Texas cotton field had eaten 127 boll weevils, and a prairie chicken had over 300 of them in its crop. The bob white has been known to eat 135 different kinds of insects. It has been estimated that this bird will consume an average of 75,000 insects and 6,000,000 weed seeds in a year. House martins, swallows, and swifts eat rose beetles, May beetles, cucumber beetles, and house flies. The quail eats Texas fever-carrying ticks; the killdeer and other shore birds feed on the larvæ of disease-carrying mosquitoes; a night-hawk's evening meal consists of 500 adult mosquitoes.

It is a very long story, this story of the value of birds to farmers and fruitmen. And it may, and should, be effective in bringing about a change in the relations between producers and birds, for the birds, themselves undesirable in cherry time, more than repay the farmer for their raids by their indefatigable search after the real enemies of his business.

Make your farm a bird refuge. Like people, birds are always on the outlook for the most desirable surroundings. They will soon learn that hunters are not allowed to trespass. Song birds will come freely, and the State game warden might be prevailed upon to furnish a few quails or prairie chickens upon application.

Project Women in Their Homes.

By Mrs. L. H. Mitchell, Midway Club, Lower Yellowstone Project, Montana.

The dictionary gives the meaning of the word "home" as one's dwelling place, but to most of us the word has a greater significance. In fact, there is no word in the English language that means so much to us as that word "home." A house may be equipped with all the modern conveniences. In fact, it may be an abode of luxury, but these things do not of themselves make it a home in the true sense of the word. On the other hand, I have been in houses where not even the common necessities of life are found, but I have found them to be real homes, homes that comply in every respect to the true definition of the word.

You all have heard that timeworn expression, "Home is where the heart is," and I know of no other words that can so well describe it.

When we stop to consider that the making and success of the home, the happiness and health of the family, depend to a large extent upon the mother we realize in what a great profession we are engaged.

We sometimes get discouraged and think how monotonous woman's work is anyway; it is the same old thing day after day, the same tasks over and over again. Then we think how nice it would be if we could go out in the world and do something really worth while. But let me ask you, mothers, is there anything more worth while, or any position with more responsibility than the one that has been placed in your hands, that of making a true home for your entire family, looking after their health and happiness, and molding the characters of our next generation of citizens? How often we hear a young mother remark, "Baby has been so cross to-day that I have not been able to do a single thing except take care of her." If she could only realize what a great work she is doing right now. While her work may show no result at the time, she is training the child's mind and morals and laying the foundation for a character that will be a credit to her in years to come.

Right here let me say how very much depends upon our manner of dealing with children while they are young. I believe that one of the first things that should be taught is honesty. And if we expect our children to be honest we must also be honest with them. I think one of the biggest mistakes a mother can make is to promise a child something and then neglect to keep that promise. Another mistake which we all have probably made at some time is to threaten the child for some disobedience, and then fail to carry out that threat. If these things are continued long the child will soon begin to lose confidence in his mother, and above all things we must have the confidence of our children.

Let us aim to make our homes such that our children will always look upon them as the dearest places on earth. May their thoughts of home be truthfully expressed by these beautiful words:

'Mid pleasures and palace, though we may roam,
Be it ever so humble, there's no place like home.

But while our chief interest and enjoyment should always be in home, we must not forget that we have duties outside that sphere also. We must forget the little petty worries that so often annoy us, and remember that our neighbors, too, have a right to our service. I know of nothing more beneficial in bringing us in contact with one another than these neighborhood community clubs. They bring us together in a friendly way, make us forget our worries, and help us all to work together for the good of the community. I believe that women should have as much interest in

the club as the men, and I am glad to have a part in this, the first program of the Midway Club, given entirely by the women.

The program for this meeting also included an illustrated talk by Miss Erickson, on balanced rations, that was reported as very enlightening and valuable to the large audience. Miss Barker and Mrs. May each had an article on "What is the matter with Midway?" and if all of their suggestions are carried out there won't be anything at all the matter with Midway. Mrs. Brodin sang delightfully, and altogether it was a rousing, enthusiastic meeting.

Olathe Woman's Club Fosters Progress and Culture.

Mrs. Mary O. Dennis, of Olathe, Uncompahgre project, Colorado, has sent in a most interesting article on the Woman's Club, recently published in the Pueblo Chieftain:

"Every community, whether a city of many thousands or a village of less than a hundred, has its class of order-loving, beauty-loving, progressive people who have an ambition to improve themselves and their surroundings, to advance in the ways that make life more worth while. Sometimes they take a feeble and spasmodic interest in such matters, and again they are earnestly on the job, either working and planning every day in the year and part of the nights. This latter class is probably more earnest and numerous in Olathe in proportion to population than in most towns, and is particularly noticeable in the membership of the Olathe Woman's Club."

"Before going further on the subject of the Woman's Club a word about Olathe might not be amiss. The name is of Indian origin and means 'beautiful place.' The red men of the mountains came to this spot and pitched their tepees in the shade of giant cottonwoods on the banks of the Uncompahgre River in the widest part of this smiling Uncompahgre Valley, and they called the spot 'Beautiful.'"

"The census of 1920 gives the town 489 inhabitants. Most of us believe the census man missed about 100 people, but what's the difference; in 1930 we expect to number at least 2,000. So far we have been considering the incorporated town of Olathe, but not all of the real Olathe is inside the corporate lines. For a mile or more out on every road leading into town the holdings are small and the houses close together, almost like streets in town, and the occupants of these houses, with many others still farther out, consider themselves Olathe people."

"The Woman's Club was organized January 11, 1916, the prime movers being Mrs. W. C. Holman and Mrs. E. G. Dennis. They were intimate friends and one day were talking together about what might be done in the way of improving the town they had

adopted as their home and which they loved. They decided to invite a few kindred souls to join them, and a short time later the club was organized, its object as stated in the constitution being the general improvement of its members, of Olathe, and of the community. The present membership is about 35.

"About the first practical work of the Woman's Club was in the direction of mental improvement, and the foundation of a public library was laid. Books were bought and books were given. The women so stirred the community with their arguments and appeals that nearly everybody found a few books to donate. It became the fashion to donate books to the library, and one citizen, Mr. S. V. Bobaugh, donated more than 100 volumes. Unable to pay a librarian, the women took turns acting in that capacity and keeping the library open to the public. Four years ago the building which housed the precious collection was destroyed by fire. Twelve hundred volumes and over \$100 worth of tables and bookcases belonging to the club went up in smoke. Undismayed, the ladies at once began a new collection.

"The town authorities were planning a new city hall. The club prevailed upon them to include a room for the library. This new city hall is rather an imposing building. Built of brick, on a prominent corner, with furnace heat and electric lights, the first floor above the basement contains two spacious light and airy rooms, one for the city business, and one for the library. A paid librarian is in charge. There are 2,500 volumes and sufficient cases and shelving, besides desks and reading tables. The records show that an average of over 400 volumes a month are used by the patrons.

"Other public benefactions to their credit are the reclamation of an unsightly desert of greasewood on the railroad property across from the depot, the establishment of a tourist camping ground, beautifying of the cemetery, and countless other activities. Their pet ambition just now is a community building; they already have half a block of land near the center of town as a site. There is not space to record all the activities of this devoted, tireless band of live wires. They certainly have set a high mark for other clubs."

Orland Scores Again.

Orland project women are proud. One of their number, Mrs. J. C. Hamilton, of the Woman's Improvement Club of Orland, has been chosen president of the newly created Federation of County Clubs. The federation was effected at Willows and a clever program and delicious luncheon added to the joy of the occasion.

Holstein Calf Club.

Holstein experts are scouring California for calves of the proper sort for what promises to be one of the biggest calf clubs of the State. The club is to be on

the Orland project, California, and only pure-bred animals of the highest type will be accepted. The committee in charge of securing the calves has been limited to \$200 apiece in the purchase of stock, but at present prices it is asserted by stockmen this should land some of the most attractive offerings of the State.

The new club expects to be organized and ready to begin business in a very short time, and will take its place alongside the Jersey Calf Club in competition along the lines of scientific handling of the pets. The calves will be scored before being put into the hands of the youthful owners, and the entire lot will be brought to the Glenn County Fair next September, where they will be scored for progress. The display and parade of the calves will form one of the interesting features of the fair. The scoring at that time will be the first grading for progress, and the final awards will be made after the appearance and scoring at the fair one year later.

The formation of this second calf club is regarded with much satisfaction, not only by the stockmen and promoters of educational work among the young folks but also by all who are interested in the general development of the community. The great interest now being taken in fine cattle is taken as a sure indication of a revival of interest in such lines of endeavor and a presage of a marked increase in the number of herds, especially of dairy cattle, through the county. The cattle industry during the past two years has suffered seriously through the high price of feed materials and the high cost of labor, but men intimately acquainted with conditions now predict that there will be a decided increase from the present time on, and that Glenn County will be found to be in the lead in the breeding of fine strains of dairy cattle among all the counties of the State within a comparatively short space of time.

The members of the boys' and girls' clubs won't have to "be kept" on the farms; they will stay willingly.

Fight the Fly to the Finish.

Spanish Fork, Strawberry Valley project, Utah, is in the throes of a strenuous fly campaign, the biology students of the high school having arrayed themselves against the "varmints."

The students have been chosen as chairmen of committees to count the number of homes and places of business in their respective wards, and they will report the percentage of homes having flycatchers at work. They are urging residents to take especial pride in eliminating the flies. Fish, cabbage, honey, bran, vinegar, and sugar are some of the baits recommended for the flycatchers in order to make a better, cleaner, and healthier community. The campaign was inaugurated by the Home Bureau.

Reclamation Record Cook Book.

ENCHILADAS.

(By William E. Smythe, of the Secretary's staff.)

- | | |
|---------------------------------------|---------------------------------|
| 15 dried peppers. | $\frac{1}{2}$ cup flour. |
| $\frac{1}{2}$ pint California olives. | $\frac{1}{2}$ teaspoonful salt. |
| 1 cup grated cheese. | 1 tablespoonful lard or |
| 4 tablespoonfuls minced | shortening. |
| chives or onions. | 1 egg. |
| 2 cups corn meal. | 1 tablespoonful vinegar. |

Remove all seeds and string from peppers, wash thoroughly, put in stew pan, cover with 1 pint of water, and cook until the pulp on peppers is soft, about 20 minutes. Strain through colander into deep bowl and mash chilies—the pulp will go through leaving skins behind—mix the pulp well with water and add the vinegar to this. Have frying pan hot. Put in a heaping kitchen spoonful of lard. When melted and hot put in a teaspoonful chopped onions, let brown slightly, add a heaping spoonful (also kitchen and quite large) of flour, and stir well together. Then put in pepper pulp and the salt.

Should sauce be too thick, thin down with boiling water.

Cut olives in small pieces, grate cheese, and mince onions or chives. Make a batter of the meal, flour, half teaspoonful salt, lard, and egg, a little thicker than for hot cakes. Fry in hot lard or oil in small cakes. Cook all the cakes first, dip them in the chili sauce one at a time, put on hot platter, sprinkle olives, onions, and lastly cheese on each one, layer by layer, until all the cakes are used up, then pour sauce over all.

CHICKEN JAMBALAYA.

(By William E. Smythe, of the Secretary's staff.)

Chicken jambalaya is one of those dishes that every Creole cook knows how to make, but printed recipes are few and far between. In New Orleans at Brasco's Restaurant they used to serve chicken jambalaya cold, after running it into a mold from which it was turned and sliced, and a more delicious dish could not be imagined.

Cut a young chicken into small pieces and stew until tender, having the meat covered with broth when done. Remove the meat, drain, and fry to light brown with two slices of onion. Put the chicken, onion, and 100 California oysters (equal to about 25 eastern selects) back into the broth and season with salt, pepper, juice of a lemon, bruised clove of garlic, chopped green pepper, and a pinch of red pepper. Let all come to a boil. Wash and dry two cups of rice and put into soup and cook until thoroughly done and moderately dry (25 minutes). Serve hot or cold.

FRUIT COOKIES.

(By Anne Chase, El Paso Office, Rio Grande Project.)

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| 1 cup butter. | 6 candied cherries or citron, |
| $1\frac{1}{2}$ cups sugar. | size of walnut. |
| 1 teaspoonful vanilla. | Grated rind of one orange. |
| 1 candied orange peel. | 3 eggs dropped in. |
| 1 candied lemon peel. | |

Mix all ingredients with enough flour to make a stiff drop batter. Use batter the size of a walnut for each cookie, placing a half pecan meat on each and brushing with beaten egg.

CHEESE SPREAD.

(By Miss C. D. Mantle, Clerk, Washington Office.)

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|---|---------------------------------------|
| 2 packages Philadelphia | $\frac{1}{2}$ cup desiccated coconut. |
| cream cheese. | $\frac{1}{2}$ cup chopped raisins. |
| $\frac{1}{2}$ cup chopped walnut meats. | |

Mix well and spread on saltines or other crackers.

POTATO AND EGG SALAD.

(By Miss C. D. Mantle, Clerk, Washington Office.)

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| $1\frac{1}{2}$ cups cold boiled potatoes | Mayonnaise. |
| (cubed or diced). | Parsley. |
| 1 canned pimento cut in strips. | 3 hard-boiled eggs. |
| 2 slices of onion chopped fine. | |

Mix potato, onion, and pimento; moisten with dressing; arrange in mound on platter or serving dish; chop whites of eggs and place on two-fourths of mound opposite each other; put yolks through ricer and arrange on other two-fourths, separating yolks and whites with sprigs of parsley; place one or two slices of egg on top of mound, with sprig of parsley.

PINEAPPLE SALAD.

(By Miss C. D. Mantle, Clerk, Washington Office.)

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| 1 can pineapple. | 1 bottle stuffed olives. |
| 1 head lettuce. | Mayonnaise. |
| 1 can pimento. | |

Place one slice pineapple on crisp lettuce leaf; fill cavity of pineapple with stuffed olives; cut pimento into poinsettia-shaped five-point leaf, and place over pineapple.

APPLE SAUCE CAKE.

(By Ottamar Hamele, Chief Counsel, Reclamation Service.)

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| $\frac{1}{2}$ cup lard. | $\frac{1}{2}$ teaspoonful cloves. |
| 2 cups sugar. | 1 teaspoonful cinnamon. |
| 2 cups unsweetened apple | 5 cups flour. |
| sauce. | 2 cups raisins. |
| $1\frac{1}{2}$ teaspoonfuls soda. | |

Cream lard and sugar and add apple sauce in which soda is dissolved. Add other ingredients and bake.

CANDIED SWEET POTATOES.

(By J. A. Moss, Clerk, Washington Office.)

Peel and slice raw potatoes, and lay in pan with generous quantities of butter and sugar. Add a little cold water and bake slowly.

Soap.

All drippings are saved; all superfluous fat from meats and fowls is tried out and added to the drippings. This is done faithfully and systematically each day. It is astonishing how fast the grease accumulates. The care in saving the grease is also a great protection to the kitchen plumbing.

The formula for making the soap is as follows:

- 5 pounds of clear grease.
- 1 pound can of lye.
- 1 quart cold water.
- 1 large spoon of powdered borax.

Dissolve the lye in the water the night before the soap is to be made. In the morning add the borax. Now have the grease just warm. Into this pour the lye, borax, and water gradually, stirring vigorously all the while until mixed. Continue to stir for 15 minutes, or until the mixture is thick like molasses and will be brown. As the soap hardens it becomes white. Have a box or pan lined with paper into which pour the mixture and set aside to harden. Made in the morning the soap will be ready by evening to mark off into desired sized cakes. Leave in the mold two or three days, then take out and stack to harden.

DIARY OF A WESTERN BOY IN EUROPE—Continued.

By William E. Smythe, Jr.

CHAPTER VII.—LONDON TOWN.

THE nonstop Bristol-London express glided quietly into Paddington station and I was out at a bound, eager to get my first view of the great Metropolis. It was a lively scene that met my eye—porters hurrying hither and thither; luggage tossed out of the van; the low-built engine puffing and hissing, as if well satisfied with its day's work. I turned my attention to the numerous cabs whose drivers were vigorously canvassing for patrons. There were taxicabs of the universal type, and some of a less common variety; there were hacks of every age and state of depreciation; but the object that caught my eye was an old-fashioned hansom cab. This I engaged and, after hiring a porter to boost my pack and trunk onto the roof of the vehicle, I got inside and slammed the doors. I directed the cabby to take me to the Strand-Palace and then sat back, prepared to make my entrée as impressive as possible.

I quickly discovered that there is an indescribable atmosphere to London which makes it different from any other city in the world. When in Bristol, Newport, or Cardiff one might be almost anywhere, but when one arrives in London he is beyond all doubt or question in London. So I rode through narrow, winding streets and out upon a wide avenue past Hyde Park. Then down Regent Street and the Strand to the Strand-Palace Hotel. I was about to alight when a porter came out and told me that there were no rooms to be had, but advised me to go to the Tavistock Inn. I was driven thence and found it to be a very old inn, indeed. It was situated on a narrow street in the heart of the business district of Westminster. Its upper stories hung out over the sidewalk and were supported by huge pillars.

After placing my luggage I found it to be 8.30 p. m. and so decided to see a bit of London. I walked to the new Edith Cavell statue, which stands at the head

of Trafalgar Square, and afterwards all around the theater district. About 10 o'clock, the hour when all the "pubs" close and many riotous drunks are thrown out on the street, I decided to return to the hotel, but found that it was easier said than done. I realized that I was in an entirely different part of London from that which I had seen from the cab. I asked policeman after policeman and wandered through many a dark alley before I finally found my inn.

The next day was Sunday. I went to church in the morning, and in the afternoon to visit friends of my family in Essex County. There I stayed off and on for three weeks, going into London every morning and back in the afternoon. I often took long walks in Epping Forest, where Robin Hood and his merry men used to roam.

Bright and early Monday morning I set out for the Tower of London. It was a cold, cloudy day quite in tune with the spirit of the tower. I spent two hours looking at the armor, the moat, crown jewels, Bloody Tower, Traitors' Gate, and other features. However, it did not meet my expectations in one respect, for I thought I would find a tall stone tower, as the name implies. Instead it looks like a very old castle with a series of towers whose winding stairs are worn thin by the tramp of many tourists.

Leaving the tower, I walked up to Trinity Square and discovered an old guide, who volunteered to show me over that part of the city. He took me first to the old Billingsgate Fish Market, where all of London's fresh and salted fish are sold to the retailers daily. As it was nearly 10 o'clock the fish had all been disposed of and men and women were carrying out loads of empty boxes on their heads and cleaning the floor for the next day. It was in this district that the air raids did the most damage. I was shown a number of small but beautiful churches, which had been quite

popular in their time but are now attended by only one or two persons. The wholesale district has submerged them. We went through one of these forgotten churches and among other things saw two old fire engines that were in use two or three years after the great London fire.

From the church we went up to the famous London Monument which marks the spot where the fire stopped. I gave the guide tuppence to get some "Bass" (ale) then went up in the monument, from which I was able to get a very good view of the city and surrounding boroughs. Next we visited London Bridge, which is a very ordinary bridge, indeed, but interesting because of the traffic and surroundings. A steady stream of double-deck motor buses, taxicabs, and carts cross the bridge, while tugs tow strings of snub-nosed barges beneath it. On one side are the wharf and warehouse, where the fruit-laden ships arrive daily from Barcelona, Spain.

After watching these activities for some time we crossed over to the south side and saw the old Southwark Church with its Harvard Memorial Chapel, built in honor of the founder of Harvard. From there we wandered down a number of dark alleys between breweries until we came to a house with a bronze tablet which informed us that we were standing on the site of the old Globe Theater where Shakespeare had played. It was raining when we again found ourselves on London Bridge, so I gave the guide half a crown for his half days' work and made my way to the nearest Lyons tea room for lunch.

On another occasion I visited the great St. Paul's Cathedral with its majestic heights. From there I went to the Bank of England, Royal Exchange, and Mansion House. I was very glad to get a chance to see the inside of the Mansion House, home of the Lord Mayor of London. It is very beautiful with its luxurious furnishings and magnificent high-ceiled walls. I next took a Victoria bus to Westminster Abbey, where I attended a service and was thrilled to see the familiar bust of Longfellow in the Poet's Corner. On leaving the building I thrilled again on seeing the large statue of Abraham Lincoln across the street. It had been unveiled only three weeks before. What an honor and how richly he deserves it! I walked along the Thames embankment and so arrived at the Tavistock Inn for supper. That night I went to the theater and saw "Paddy, the Next Best Thing."

One day I took a Metropolitan underground out to the Museum of Natural History near Kensington Gardens. There I spent the morning browsing among the fossils of animals long extinct. From the museum I took the underground to Baker Street and visited Madame Tussaud's Wax Works, containing all the famous people of the world, from Julius Caesar to Theodore Roosevelt. I also inspected the Chamber of

Horrors, where wax figures of all England's most infamous people are kept.

Transportation in London is remarkably efficient. The city is criss crossed by numerous lines of buses that run every two or three minutes, while the surrounding boroughs are well served by noisy, top-heavy trams. The underground trains run under the entire city and are not only very fast but more comfortable than the New York City subways. Beneath the underground railroad are the tubes, which are reached by moving staircases, and are even faster than the underground. Both underground and tube trains are supplied with automatic couplers. All other English railroads connect their cars by means of chains and bumpers.

Finally, one evening I returned to Paddington Station and boarded a Great Western train. My baggage settled in the compartment, I made my way to the dining car and ordered a substantial meal. When I was asked what I would have to drink, I said:

"Gin—" (the train gave a jerk as it started on its way to Wales) "ginger ale," I said.

"Oh, gin and ginger ale," the waiter repeated and was gone before I could correct him. Thus in Europe I even had strong drink thrust upon me. The outskirts of London slipped behind me as the train rushed toward the setting sun and my own native land.

KILL POCKET GOPHERS IN IRRIGATION PROJECTS.

Pocket gophers burrowing in the ditch banks and adjacent bottom lands below the Elephant Butte Dam, in Dona Ana County, N. Mex., cause seepage damage estimated at \$60,000 a year. Irrigation farmers last year enlisted the directive assistance of the United States Department of Agriculture Biological Survey, and a project of extermination was undertaken in September. Both traps and poisoned baits were used.

One method was for a workman to patrol the banks of the main ditches, setting a string of 50 traps at short intervals. On his return he would find pocket gophers in two-thirds of them. In doing this advantage was taken of the rodents' dislike for warmth and light. Runways were found by means of a prod, and a hole was broken, under which the trap was set. The gopher would hasten to the spot to repair the break and find himself in the trap. Cubes of strychnine-mixed bait were dropped into similar holes on level ground.

A survey taken early this spring by a rodent inspector of the Biological Survey indicated that 95 per cent of the pocket gophers had been exterminated, practically eliminating the \$60,000 annual damage. The total cost to the farmers was about \$3,500.



Keep Young Chicks Growing.

By H. O. Numbers, Poultry Expert, Loretto, Pa.

IT is presumed that during this month you have your chicks hatched and a start of several weeks growth. The fact should be impressed that you must keep your youngsters growing. They should not be allowed to become "stunted" even for a day. Following are a few of the more common causes of "retarded growth":

Overheating or chilling. It should be remembered that when your chicks pass over the two weeks' age limit they are shedding the down and taking on feathers. No mistake should be made in imagining that the youngster can do without heat at night, because it is shooting its feathers. A temperature of 75° to 90° must be maintained in a properly ventilated brooder or they will crowd, and the result will be leg weakness, diarrhea, and dead chicks.

Chicks can be killed just as quickly by overheating.

Overfeeding takes its toll in mortality. The youngster will not eat too much, but the feed in excess of what it consumes lies around, sours, and either ferments or becomes musty and stale. Invariably chickens will seek out some forbidden diet. If musty feed is near, they will be sure to eat some and then your trouble begins. It is believed that the only rule to follow in feeding is to give them as much as they will dispose of in half an hour. This does not apply to dry mash, as this should be before the chicks all the time.

The following feeding schedule for youngsters is offered for the benefit of our readers:

Fresh water in all fountains before chicks are awake in the morning. To each quart of drinking water should be added one tablespoonful of lime water.

First feed: Oats, sprouts, or lettuce at about 7.30 a. m.

At 11 a. m. should be fed green cut bone or butter-milk. The green bone should be given about twice a week and on the other days milk curds.

At 3 p. m. feed another lot of greens—oats, sprouts, lettuce, etc.

At 5 p. m. the chicks should get all the grain they

can clean up, composed of one-third cracked wheat, one-third cracked corn, one-third steel-cut oats.

The mash hoppers used at our establishment are open all day, and we are feeding at present (Apr. 12) a commercial mash. At other times we mix equal parts of bran, oats, chop, cornmeal, and white middlings, and add 10 per cent of beef scraps. We use sand for litter. We have White Leghorn broilers 7 weeks old that weigh almost 1 pound fed on the above schedule. We have endeavored to cover a wide scope as briefly as possible, and believe we have cited the most flagrant causes of the high mortality in youngsters passing from the two weeks' age limit into the broiler stage.

How to Fail in a Dairy.

Sometimes the best way to show how to do a thing is to tell how it should not be done. Then the way to succeed will be clearly evident. With this plan in view the Weekly News Letter of the Department of Agriculture presents the following rules compiled by a West Virginia farmer. The farmer-humorist says:

Don't weigh your milk, for then you might have to figure and think.

Feed the cows timothy hay—it is good for race horses.

Cow-testing associations are needless—they show how to save and know.

Keep the barn hot—cows are like woodchucks.

Don't have many windows in the barn—the hired man might look out.

Keep the water ice cold—shivering gives the cows exercise.

Avoid heavy milkers—they consume too much valuable time.

Kill Alfalfa Pest with Poisoned Bran.

A close study of the life and habits of the range crane fly and its larvæ by entomologists of the United States Department of Agriculture in the grasslands and grain fields of California has resulted in the discovery of new facts which offer means of extermination. The larvæ, which are blackish worms from one-half to 1 inch in length, have been found in such great numbers as to kill off entire tracts of alfalfa, grain, and grass.

The entomologists discovered that the worms come to the surface at night to feed on the young plant shoots. They also discovered that the pests will eat wheat bran, which is commonly used as an insect bait. They tried a poisoned bran mixture, after the formula used in poisoning grasshoppers, which consists of 1 pound Paris green to 25 pounds of bran, mixed in water enough to make a crumbly mash, and spread on the land at the rate of 10 to 20 pounds to the acre. From 70 to 90 per cent of the insects were killed.

A SUCCESSFUL WATER USER.

**Frank M. Kerr, Lower Yellowstone Project,
Montana-North Dakota.**

AT the request of Project Manager Mitchell of the Lower Yellowstone project, I will endeavor to give a few facts regarding corn production under our conditions here.

During the past five years, in spite of all kinds of climatic conditions, I have grown corn, and what I have accomplished on one of the poorest units in the valley anyone can do by practicing modern systems of farming.



Frank M. Kerr in his corn field.

The most important item is acclimated seed properly cared for until needed. I would rather pay \$5 per bushel for seed raised in this locality than have eastern-grown seed laid down at my farm free of charge. Upon repeated tests by myself and the State agricultural college at Bozeman the germination from about 75 bushels of seed corn I raised last year was 100 per cent.

From my experience the best time to plant corn is between the 15th and 20th of May. It is my belief that too many farmers in eastern Montana plant their corn two or three weeks too late and use poor quality of seed. The combination is bound to bring poor results.

I use a surface cultivator, not to kill weeds but to keep them from starting and always keep a dust mulch. When one waits until the weeds are as high as the corn before cultivating, and then goes after them with a four-shovel cultivator, thereby leaving the

ground loose to dry out, is there any wonder such farmers say, "We can't grow corn here"? For me corn is the surest and easiest crop to grow there is. Another reason why I grow corn is the assurance of a grain crop the following year. In 1920 I had wheat on ground that was a cornfield the year previous. This wheat was seeded on the same day as a field of spring-plowed stubble ground. The wheat on the corn-ground yielded 13 bushels per acre more than the other.

Last year my corn yielded 62½ bushels per acre. This was Minnesota Thirteen. From another field of corn (grown on ground that had been in alfalfa) planted for fodder there was harvested a little over 18 tons per acre.

I seldom irrigate corn more than once. In addition to the corn and the increase in the yield of grain crops the following year there is the roughage for feed, which, in my judgment, makes corn one of our most valuable crops. My success with corn dates back a good many years when "dad" convinced me of the proper method of cultivating all crops. In addition to the corn prizes taken at the Richland County Fair, the State Fair at Helena, and the corn shows at Miles City and Chicago, I received seven first ribbons, six seconds, and one third on other crops, and am frank to admit that I am proud of it.

Some one has given me the title of "Corn King" of the Lower Yellowstone Valley. This honor belongs to Mr. Roy Beagle, one of my neighbors, who has been carrying on experiments with corn for five years that put my efforts in the shade, and I would suggest that the Reclamation Service endeavor to have him write an article for the RECORD as to his accomplishments.

RECLAMATION ABROAD.

Murray River Irrigation Agreement, Australia.

The Commonwealth and the State governments of Victoria, New South Wales, and South Australia have completed the agreement for the storage and use of the Murray River waters. This agreement creates a joint commission of the governments concerned, the cost to be borne in equal shares by each. If in any one year the amount to be provided by any State government exceeds £125,000, the Commonwealth shall advance by loan the amount in excess of that sum, the loan carrying interest at current rates. Should any contracting government refuse or neglect to carry out the work or contribute its proportion of the cost, the commission has been given power to operate the works and recover the amount involved plus interest.

We like the RECORD very much and consider it a valuable paper.—F. J. Steffen, Burns, Mont.



Bothwell v. The United States.

ALBERT J. BOTHWELL and the Bothwell Co. owned and utilized in their business of stock raising a large tract of land lying in Sweetwater Valley, Wyo. In June, 1909, they had confined on this land about 1,000 head of cattle. The United States condemned the land for use in connection with the construction of the Pathfinder Reservoir for the North Platte Federal irrigation project. The land was inundated by the waters of the reservoir, and it became necessary to remove the cattle and sell them at prices below their fair value. The owners claimed large damages consequent upon this forced sale of their stock and the destruction of their cattle business. Suit was brought in the Court of Claims, where this claim was disallowed, and on December 6, 1920, the judgment of the Court of Claims was affirmed by the United States Supreme Court.

The Supreme Court held that there was no actual taking by the United States of the things complained of, and consequently there was no basis for an implied promise to make compensation therefor.

Application of Moneys Collected for Drainage on the Boise Project.

Moneys in the reclamation fund arising from operation and maintenance charges, regardless of the date of payment or collection thereof, can be made available for expenditure only in accordance with the provisions of section 16 of the act of August 13, 1914 (38 Stat., 690). Moneys paid in advance to the United States for drainage purposes under public notice of February 15, 1921, for the Boise Federal irrigation project in Idaho are not available for expenditure until specifically appropriated. (Compt. Dec., Apr. 2, 1921.)

Bills Introduced in Congress.

IN THE HOUSE.

H. J. Res. 30.—"Joint resolution to amend a joint resolution entitled 'Joint resolution giving to discharged soldiers, sailors, and marines a preferred right to homestead entry,' approved February 14, 1920," introduced April 11, 1920, by Representative Nicholas J. Sinnott, of Oregon.

H. J. Res. 52.—"Joint resolution to authorize the Secretary of the Interior, in his discretion, to furnish water to applicants and entrymen in arrears for more than one calendar year of payment for maintenance or construction charges, notwithstanding the provisions of section 6 of the Act of August 13, 1914," introduced April 14, 1921, by Representative Moses P. Kinkaid, of Nebraska.

H. R. 1.—"A bill to provide adjusted compensation for veterans of the World War, and for other purposes," introduced April 11, 1921, by Representative Joseph W. Fordney, of Michigan.

H. R. 30.—"A bill to provide a national budget system and an independent audit of Government accounts, and for other purposes," introduced April 11, 1921, by Representatives James W. Good, of Iowa.

H. R. 70.—"A bill to allow credit for husbands' military service in case of homestead entries by widows, and for other purposes," introduced April 11, 1921, by Representative Burton L. French, of Idaho.

H. R. 119.—"A bill for the reclamation of swamp, cut-over, and overflowed lands, and providing for the cost thereof," introduced April 11, 1921, by Representative William E. Mason, of Illinois.

H. R. 180.—"A bill to provide adjusted compensation for veterans of the World War, to provide revenue therefor, and for other purposes," introduced April 11, 1921, by Representative James A. Gallivan, of Massachusetts.

H. R. 197.—"A bill authorizing the lease of lands containing deposits of minerals, oil, oil shale, or gas by the State of Washington for longer periods than five years," introduced April 11, 1921, by Representative Albert Johnson, of Washington.

H. R. 244.—"A bill to provide for the disposition of abandoned portions of rights of way granted to railroad companies," introduced April 11, 1921, by Representative Charles A. Christopherson, of South Dakota.

H. R. 2198.—"A bill providing for appeals from decisions of the Secretary of the Interior," introduced April 11, 1921, by Representative Frank W. Mondell, of Wyoming.

H. R. 2202.—"A bill granting locations and rights of way for purposes of irrigation and other beneficial

use of water through the public lands and reservations of the United States," introduced April 11, 1921, by Representative Frank W. Mondell, of Wyoming.

H. R. 2279.—"A bill to give preference in appointments to Government positions to honorably discharged soldiers, sailors, and marines, to reservists who have been placed on inactive duty, and, under certain circumstances, to the wives or widows of such persons," introduced April 11, 1921, by Representative John J. Rogers, of Massachusetts.

H. R. 2325.—"A bill to reorganize the Indian Service, to expedite the settlement of Indian affairs, and for other purposes," introduced April 11, 1921, by Representative Homer P. Snyder, of New York.

H. R. 2350.—"A bill to provide for the distribution of receipts by States under the provisions of section 35 of the act of Congress approved February 25, 1920, entitled 'An act to promote the mining of coal, phosphate, oil, oil shale, gas, and sodium on the public domain,'" introduced April 11, 1921, by Representative Edward T. Taylor, of Colorado.

H. R. 2351.—"A bill to increase without expenditure of Federal funds the opportunities of the people to reclaim and acquire rural homes, and for other purposes," introduced April 11, 1921, by Representative Edward T. Taylor, of Colorado.

H. R. 2389.—"A bill making an appropriation to be expended under the provisions of the act of March 1, 1911 (36 Stats., p. 961), entitled 'An act to enable any State to cooperate with any other State or States, or with the United States, for the protection of the watersheds of navigable streams, and to appoint a commission for the acquisition of lands for the purpose of conserving the navigability of navigable rivers,' as amended," introduced April 11, 1921, by Representative Edward H. Wason, of New Hampshire.

H. R. 2425.—"A bill to amend section 2 of the act of August 9, 1912 (37 Stat. L., 265), relating to liens in patents and water-right certificates," introduced April 11, 1921, by Representative Moses P. Kinkaid, of Nebraska.

H. R. 2431.—"A bill to authorize advances to the reclamation fund to complete reclamation projects already begun," introduced April 11, 1921, by Representative Carl W. Riddick, of Montana.

H. R. 2433.—"A bill authorizing an appropriation for continuing irrigation and drainage on the Yakima Indian Reservation," introduced April 11, 1921, by Representative John W. Summers, of Washington.

H. R. 2447.—"A bill amending the act of February 25, 1920, entitled 'An act to promote the mining of coal, phosphate, oil, oil shale, gas, and sodium on the public domain, and for other purposes,'" introduced April 11, 1921, by Representative Lucian W. Parrish, of Texas.

H. R. 2889.—"A bill making available additional moneys for the reclamation fund, and for other pur-

poses," introduced April 13, 1921, by Representative Carl Hayden, of Arizona.

H. R. 2906.—"A bill to provide for an investigation to ascertain the feasibility of the construction of a reservoir and irrigation project in the Santa Fe River, Santa Fe County, N. Mex.," introduced April 13, 1921, by Representative Nestor Montoya, of New Mexico.

H. R. 2913.—"A bill to encourage the development of the agricultural resources of the United States through Federal and State cooperation, giving preference in the matter of employment and the establishment of rural homes to those who have served with the military and naval forces of the United States," introduced April 13, 1921, by Representative Addison T. Smith, of Idaho.

H. R. 2916.—"A bill providing for the investigation of the feasibility of reclaiming by irrigation certain lands in the State of Idaho for agricultural purposes," introduced April 13, 1921, by Representative Addison T. Smith, of Idaho.

H. R. 2917.—"A bill to give preference right of employment on construction work on United States reclamation projects, and preference right of entry on the public lands within such projects, to honorably discharged soldiers, sailors, and marines," introduced April 13, 1921, by Representative Addison T. Smith, of Idaho.

IN THE SENATE.

S. 21.—"A bill authorizing the lease of school lands containing deposits of coal, oil, oil shale, or gas by the State of Washington for longer periods than five years," introduced April 12, 1921, by Senator Miles Poindexter, of Washington.

S. 203.—"A bill to encourage the development of agricultural resources, water power, and waterways of the United States through cooperation of the United States with the several States of the United States, in conjunction with each other, giving preference in the matter of employment and the establishment of rural homes to those who have served with the military and naval forces," introduced April 12, 1921, by Senator Wesley L. Jones, of Washington.

S. 218.—"A bill to provide for the application of the reclamation law to irrigation districts," introduced April 12, 1921, by Senator Key Pittman, of Nevada.

S. 219.—"A bill for the examination and survey for irrigation works for the storage and diversion and development of waters on the watershed of the Truckee River," introduced April 12, 1921, by Senator Key Pittman, of Nevada.

S. 226.—"A bill to authorize the Secretary of the Interior to convey title to certain lands in the State of Nevada," introduced April 12, 1921, by Senator Key Pittman, of Nevada.

S. 240.—"A bill authorizing the exchange of certain lands in the State of Nevada," introduced April 12, 1921, by Senator Key Pittman, of Nevada.

S. 241.—"A bill to aid in the reclamation of lands in the bed of Carson Lake, in the State of Nevada," introduced April 12, 1921, by Senator Key Pittman, of Nevada.

S. 242.—"A bill to aid in the reclamation of certain lands in portions of the bed of Virgin River, in the State of Nevada," introduced April 12, 1921, by Senator Key Pittman, of Nevada.

S. 243.—"A bill to promote the utilization and disposition of the waters of the Colorado River for irrigation and power uses, and for other purposes," introduced April 12, 1921, by Senator Key Pittman, of Nevada.

S. 244.—"A bill to aid in the reclamation of lands in the bed of Winnenucca Lake, in the State of Nevada," introduced April 12, 1921, by Senator Key Pittman, of Nevada.

S. 484.—"A bill permitting minors of the age of 18 years or over to make homestead entry or other entry of the public lands of the United States," introduced April 12, 1921, by Senator Reed Smoot, of Utah.

S. 488.—"A bill providing for an exchange of lands between the Swan Land & Cattle Co. and the United States," introduced April 12, 1921, by Senator Reed Smoot, of Utah.

S. 491.—"A bill to provide without expenditure of Federal funds the opportunities of the people to acquire rural homes, and for other purposes," introduced April 12, 1921, by Senator Reed Smoot, of Utah.

S. 506.—"A bill to provide adjusted compensation for veterans of the World War, and for other purposes," introduced April 12, 1921, by Senator Porter J. McCumber, of North Dakota.

S. 508.—"A bill to provide funds for reimbursing farms on Yuma project, Arizona-California, and to provide funds to operate and maintain the Colorado River front work and levee system of Yuma project, Arizona-California," introduced April 12, 1921, by Senator Henry F. Ashurst, of Arizona.

S. 536.—"A bill to encourage the development of the agricultural resources of the United States through Federal and State cooperation, giving preference in the matter of employment and the establishment of rural homes to those who have served with the military and naval forces of the United States," introduced April 12, 1921, by Senator Charles L. McNary, of Oregon.

S. 563.—"A bill to amend an act approved February 25, 1920, entitled 'An act to promote the mining of coal, phosphate, oil, oil shale, gas, and sodium on the public domain, and for other purposes.'" introduced April 12, 1921, by Senator Pat Harrison, of Mississippi (for Senator William H. King, of Utah).

S. 564.—"A bill to cede unreserved public lands to the several States," introduced April 12, 1921, by Senator Pat Harrison, of Mississippi (for Senator William H. King, of Utah).

S. 566.—"A bill providing for a reclamation project on the Strawberry River, Duchesne County, Utah, to

be known as the Castle Peak reclamation project," introduced April 12, 1921, by Senator Pat Harrison, of Mississippi (for Senator William H. King, of Utah).

S. 567.—"A bill providing for a reclamation project on Price River, Utah," introduced April 12, 1921, by Senator Pat Harrison, of Mississippi (for Senator William H. King, of Utah).

S. 568.—"A bill providing for a reclamation project on Green and Grand Rivers, in the State of Utah," introduced April 12, 1921, by Senator Pat Harrison, of Mississippi (for Senator William H. King, of Utah).

S. 594.—"A bill for the relief of certain ex-service men whose rights to make entries on the North Platte irrigation project, Nebraska-Wyoming, were defeated by intervening claims," introduced April 13, 1921, by Senator Francis E. Warren, of Wyoming.

S. 666.—"A bill to encourage the establishment of farms and suburban homes by veterans of the World War," introduced April 13, 1921, by Senator William E. Borah, of Idaho.

S. 670.—"A bill providing for an exchange of lands between the Swan Land & Cattle Co. and the United States," introduced April 13, 1921, by Senator John B. Kendrick, of Wyoming.

—Ottamar Hamele.

ELEPHANT BUTTE DAM, SPILLWAY CONSTRUCTION.

The accompanying illustration, reproduced from a photograph taken on March 2, 1921, shows the progress of construction on the spillway at Elephant Butte Dam, Rio Grande Project. Although the dam was completed over four years ago, construction of the spillway was purposely delayed in order that the work



might be done at a time when the reservoir was filled sufficiently to siphon water to excavate the spillway site. In the illustration the siphon operations are shown, as well as the work of the hydraulic giant. At the time the photograph was taken over 30 per cent of the material had been excavated by this method.

ENGINEERING INVESTIGATIONS.

Progress in Investigation of Alkali Action on Concrete.

By E. C. Bebb, Engineer, U. S. Reclamation Service.

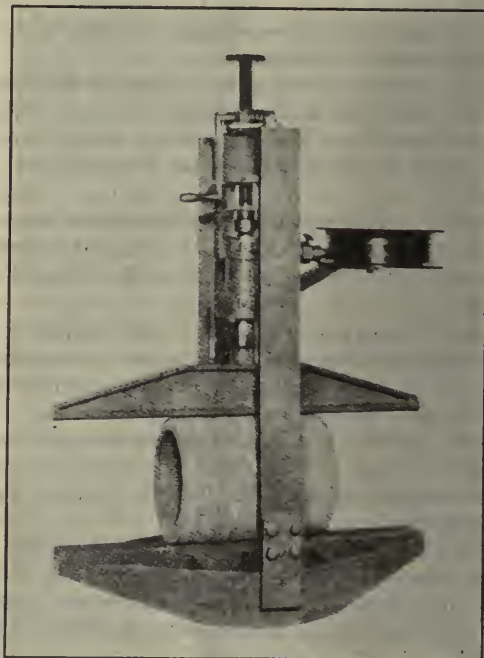
"WILL alkali really disintegrate good concrete, or have apparent cases of such disintegration resulted merely from poor concrete and ordinary weathering processes?" This has long been a moot question among irrigation and drainage engineers and cement men in the West, debated both pro and con by men of long experience. This difference of opinion was not surprising, for many who attempted to draw conclusions from collated data were baffled by the seeming conflict of results obtained under similar conditions in different localities and at different times.

To settle this uncertainty and to establish facts upon which a scientific study of remedies could be based, the Bureau of Standards, the Reclamation Service, the Drainage Investigations Office of the Department of Agriculture, and the Portland Cement Association, through an advisory committee composed of representatives from each organization, undertook, in 1913, a field investigation of the durability of cement drain tile and concrete in alkali soils.

During that year sixteen types of cement drain tile 8 inches in diameter and 12 inches long were manufactured and installed in working drains in alkaline areas in eight localities in the Western States, five of the installations being on the following reclamation projects: Shoshone, Sun River, Yakima, Yuma, and Uncompahgre. For purposes of comparison similar installations were made in fresh-water drains in Minnesota and Missouri, and one set of tile was stored in the open air at Iowa State College. To replace tile removed for test, five additional types have since been installed.

These tile were manufactured by hand and on various types of commercial machines, using cement in proportions ranging from 1-1½ to 1-4, and consistencies varying from stiff "plastic" through "quaking" and "mushy" to "fluid" or "soupy." These types were chosen to bring out the effect of variations in richness, consistency, method of manufacture, and method of curing.

The tile originally installed were so grouped that excavation of a continuous trench 32 feet long would allow the removal of a section consisting of two each of the 16 types. Field tests made each year consisted of the removal of one or more such sections and crushing tests made near the drains by means of a portable tile-testing machine, designed and built at the Bureau of Standards. Samples of all broken tile were obtained, and observation made as to the condition of each, such as apparent amount of moisture and white salts in the walls. Samples of soils and waters were obtained twice a year.



Portable tile-testing machine of the three-edge bearing type used in testing experimental tile at the site of the drain. The pressure which is applied to the tile through the worm gear and screw is measured by the hydraulic gauge attached to the ram. All parts excepting the gears and gauge are made of cast aluminum.

In 1915 the investigation was extended to cover the effect of alkali waters on concrete placed above and below the ground line as in ordinary surface structures. Blocks 10 inches square and 2½ feet long were molded to be placed vertically with the lower 1 foot embedded in the ground. Two vertical steel reinforcing rods were placed in each block 2 inches from the surface, and a third rod formed a loop projecting from the top, which aided in handling. One series of these blocks was molded at Denver, a central point, where an excellent quality of aggregate was available, and shipped to all points where tests were to be made. Another series was molded on each project from the best aggregates available in commercial quantities near the construction site, and after curing for 30 days was set in place. A third series was molded in place immediately exposed to alkali water. By use of the Denver blocks a standard was set up for comparison of severity of alkali action on the various projects, and the relative resistance of the many concretes made with local materials. Comparison was also secured between precast blocks and

those molded in place using the same materials. These blocks were installed on the Belle Fourche, Shoshone, Sun River, Yakima, Yuma, Newlands, Rio Grande, Uncompahgre, and Grand Valley projects, in soils where concrete structures had apparently been affected by alkali or in particular locations where strongly alkaline waters were to be found above ground level during a large part of the year.

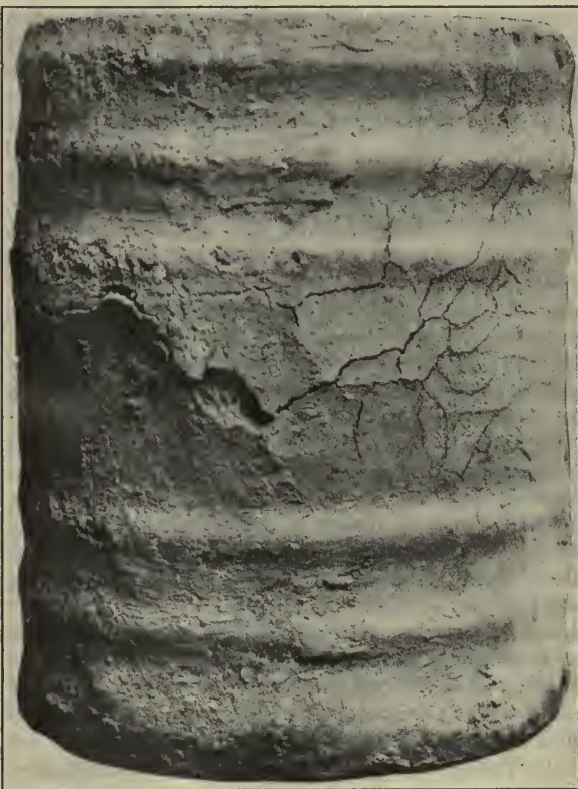
Readers who are interested will find detailed information as to the manufacture and installation of both tile and concrete specimens in Technologic Paper No. 95, issued in 1917 by the Bureau of Standards. This report also includes results of the first three years' tests of drain tile and information obtained from inspection of the concrete blocks after one year's exposure. Brief articles descriptive of the tests and progress of the investigation appeared also in the *RECORD* in February and August, 1916, and March, 1917.

The field work was interrupted from 1916 to 1919 by press of war work, but was resumed in the fall of 1919 by tests and inspection at all drains and block sites. Inspection and tests were also made in 1920 on several of the projects where the most rapid action was noted, but this examination was not general. Results to date have been compiled by Mr. G. M. Williams, of the Bureau of Standards, in a progress report which has been under consideration for some time by the members of the committee and which will probably be printed in the near future in form similar to Technologic Paper No. 95.

It is not possible within the limits of this article to go into detail as to the results, but the interest of irrigation engineers in this investigation is such that I will attempt, with the consent of the Bureau of Standards, to present, without further delay, a few of the more definite facts established, trusting that those interested will procure a copy of the report as soon as it is available and familiarize themselves with the complete data and conclusions.

Drain tile.—With reference to the drain-tile tests, results to date have served to confirm practically every one of the conclusions given in the last published report. In general the condition of the tile was quite similar to that found in 1916. Average strength results, as well as appearance of the tile with respect to salts in the walls, had not been greatly changed by the three additional years of exposure. Later results seem to lend support to the view that disintegration is primarily due to chemical action between the salts in solution and the constituents of the cement rather than to physical disruption due to crystallization, though the evidence is not convincing. If cement drain tile are to be used in soils and waters containing one-tenth of 1 per cent or more of salts of the sulphate type, their installation should be preceded by an examination of

subsurface conditions. Such an examination may indicate portions of the area where the use of cement should be avoided. Our experience has shown that the alkali content of the soil is constantly changing with changes in evaporation, rainfall, flooding, etc., and at any single period of time may differ as much as several hundred per cent in adjacent areas. In all cases where disintegration of the best quality of tile has occurred samples of the soil immediately in contact with such tile have revealed concentrations much higher than are indicated by the drain water. The presence of over 5 per cent soluble salt in the soil immediately above a tile, found in some instances, is certain to result in destructive concentrations when sufficient seepage water is present.



Swollen and cracked tile of series 16 after one year's exposure at Grand Junction, Colo. The interior surface is cracked similarly to the exterior.

To date the best results have been obtained from hand-made tile of quaking or mushy consistency, and tile made on a "tamping" machine as distinguished from the ordinary "packer-head" machine. In general the use of tile made from mortar of plastic consistency, such that the jacket can be removed immediately after molding, can not be recommended for use in sulphate soils and waters.

The alkali waters in all the areas in which our test drains have been installed are of the sulphate type. Inspection of drain tile and concrete structures in other localities where the alkali salts are of the chloride or carbonate types seems to justify the conclusion that these waters are not so severe as waters of the sulphate type.

Concrete.—Our concrete test blocks have all been exposed to waters of the sulphate type. In general, blocks which were affected in 1916 were more seriously affected in 1919, the action having been progressive. Due to changes in conditions of exposure at the various projects, the rate of disintegration has in some cases been very marked and in others little apparent change has taken place in the three-year period. Disintegration is usually first evidenced by a scaling of the neat cement film on the surfaces of a block at and just above the ground line, exposing sand grains. Further action results in exposing particles of the coarse aggregate, giving the block the appearance of having been subjected to erosion. Later spalling of larger chunks of concrete will be apparent, and if the level of the soil water is at or above the ground surface the concrete may become soft and mushy. The softening and spalling of the surfaces is also accompanied by the formation of large cracks radiating from the embedded handle steel, probably due to corrosion of the steel and the resultant expansion. The disintegrating action is not always confined to the concrete above the surface, where evaporation is high, but the lower portion of the block, which is probably always moist, may be equally affected.

No doubt the rapidity of disintegration is in some cases, especially on the northern projects, aided by extreme weather conditions, but the extent of such action can not be definitely determined. The scaling of the neat cement film, the first step in disintegration, might be explained as due entirely to freezing weather and temperature changes, yet even where extreme cold occurs it appears that this may be only a contributing factor, and that salt in solution is the primary cause of the trouble. That such scaling may occur without freezing weather has been demonstrated in a number of instances.

At Fallon, Nev., where the alkali water carries 0.10 to 0.13 per cent soluble salts, none of the blocks has been injured in any manner to date. At Sunnyside, where the percentage of salts is from 0.2 to 0.3 per cent, disintegration has been lacking or confined to surface scaling or pitting, which exposes the sand and gravel particles. At Powell, Wyo., Montrose, and Grand Junction, where concentrations have been observed varying from 0.7 to 2.5 per cent, deeper pitting and disintegration have been noted, and at Orman, S. Dak., and at Mesquite, N. Mex., on the Rio Grande, where concentrations in excess of 3 per cent have been noted, disintegration of entire blocks has occurred. At

Fort Shaw, on the Sun River project, observed concentrations have varied from 0.4 to 2.4, but the blocks show no disintegration further than surface scaling or pitting. Absence of more marked disintegration on these blocks may be due to comparatively brief periods of exposure to these concentrations. We have in the past noted rather severe disintegration in some concrete structures on this project.



View of site of new drain installed northwest of Montrose, Colo., in 1919. The seepage water has a concentration of approximately 5 per cent.

While the Denver blocks have generally been more resistant to alkali than the blocks molded on the projects, they have been seriously affected where concentrations have been high, and on one project all blocks installed may be considered as complete failures.

Summing up, our experiments seem to indicate that surface disintegration of the poorer grades of concrete begins with concentrations of about two-tenths of 1 per cent in waters of the sulphate type, and that the severity of the action increases as concentration of salts increases until with concentrations of 2 to 3 per cent even the best concrete disintegrates rapidly. As was to be expected, durability appears to be dependent upon impermeability, which in turn is mainly dependent upon richness of mix and gradation of aggregates. Given the same aggregates, lean mixtures are more seriously and rapidly affected than rich mixtures. Alkali salts are not uniformly distributed throughout the soil or through large bodies of seepage water, and it will be difficult to determine in advance the concentrations to which a structure may later be exposed.

During the past year the personnel of the advisory committee has been increased by the addition of Mr. C. J. Mackenzie, representing the Engineering Insti-

tute of Canada; Prof. D. A. Abrams, representing the Portland Cement Association, and Mr. G. E. Warren, manager of the American Concrete Pipe Association. Mr. Ferguson no longer represents the Portland Cement Association, and both Mr. Wig and Mr. Williams have left the Bureau of Standards, but fortunately it has been possible to retain them as members of the committee. Loss of Mr. Williams, who is now a member of the engineering faculty at the University of Saskatchewan, Saskatoon, Canada, would be particularly unfortunate for he has done the greater part of the work from the start and possesses much more intimate knowledge regarding it than any other member.

As to the future work of the committee, it is planned to extend its activities to certain sections of western Canada where alkali action in concrete structures has appeared as a serious menace. Some of the worst cases of alkali action known to the committee have occurred on Canadian irrigation projects, and the engineers of that section are manifesting great interest in the investigation. Inspection and tests will be continued at the present installations, probably at intervals of several years, but the committee will center its work chiefly on two or three projects in the United States and one or two in Canada where action has been most severe. At these points a large number of new specimens will be installed and intensive investigation undertaken to determine more definitely the value of various kinds of integral and surface water proofing and the rôle played by richness and consistency of mixture; composition of cement; size, grading, and quality of aggregate; quality of mixing water; and age and curing condition of concrete before exposure. A closer study will also be made of seasonal variations in concentration and composition of the salts in the soil and waters and of the destructive chemical action which takes place.

Your RECORD is a most wonderful educator to the man who wishes to make a success as an agriculturist. I have just acquired a fine farm on the banks of the Rio Grande, 28 miles above El Paso. The great Government system for watering on the Rio Grande can't be surpassed. Advice to all: Buy land there and take the RECORD, which is filled with the best of instructions. Success in life will soon follow.—*L. M. McCrummen.*

The honeybee is the fruit grower's friend. In his search for food he carries the pollen from tree to tree and from plant to plant with telling effect for good on the future crop.

MARCH WEATHER IN THE WESTERN STATES.

By P. C. Day, United States Weather Bureau.

The weather of March in the Western States continued rather dry, and for the most part was warm, though serious cold snaps were experienced in some sections. The warmth which was so marked during the last week of February continued far into March, but about the 10th colder weather visited the more northern portions, especially Montana and North Dakota. A greater area was affected by the cold spell which reached the Northwest about the 19th, and extended rapidly to eastward and southeastward. In most States the temperatures for the balance of the month shifted rapidly from cold to warm and back again, the cold snap which reached the northern Plains on the 26th being felt very severely in most districts east of the Rocky Mountain Divide, and to some extent in the Plateau region. Near the Pacific coast the month averaged slightly warmer than normal, as a rule, and the excess increased to eastward, amounting to about 8° per day in the Plains region.

The first half of the month was mainly without important precipitation east of the Divide, and to westward there was little in many districts, but toward the 15th considerable occurred near the Canadian border, mainly as snow, and there were fine rains in southern California and most of the southern Plateau region. During the latter half of the month there were rains of importance, mostly before the 23d, in Washington, Oregon, and the northern half of California, and from southern Kansas southwestward to the middle and lower Rio Grande. Otherwise the precipitation was scanty or quite lacking. On the whole, the month's precipitation was light in the West, but it exceeded the normal in much of New Mexico, Texas, and the southern Plains, and in some districts near the Canadian border, particularly Montana. The deficiency was marked in the middle portions of the Plains and the Rocky Mountain regions, in most of Nevada and California, and in the southern parts of Idaho and Oregon.

The stored snow generally promises a good flow of water in the Pacific States, Nevada, and Idaho; but the outlook is less favorable in Utah and the middle and northern Rocky Mountain region, and quite poor in Arizona and New Mexico.

The weather of March favored outdoor activities and live stock. In the main small grains were favored, though it was too dry in some areas, and harm resulted in places from the severe cold late in the month. This cold did some injury to fruit also in the Rocky Mountain and Plateau sections, especially in New Mexico, Colorado, and Utah.

The Reclamation Record.

Issued monthly by the Reclamation Service, Department of the Interior, under the authority of the Secretary of the Interior.

Copies of the RECLAMATION RECORD will be sent free of charge to any water user on our reclamation projects. The subscription price to others is 75 cents a year, payable in advance. Subscriptions may be forwarded to the chief clerk, United States Reclamation Service, Washington, D. C. and remittances (postal money order or New York draft) should be made payable to the special fiscal agent, United States Reclamation Service. Postage stamps will not be accepted.

Material for publication in the RECLAMATION RECORD should be addressed to *Editor*, United States Reclamation Service, Washington, D. C. and should be mailed in time to reach the editor not later than the 14th of the month, in order to insure publication in the succeeding month's issue of the RECORD.

HUGH A. BROWN, EDITOR.

SUBSCRIPTION BLANK.

Reclamation Record.

[To be used only by persons who are NOT water users on the projects of the U. S. Reclamation Service.]

_____, 1921.

CHIEF CLERK,

U. S. Reclamation Service,

Washington, D. C.

DEAR SIR: I am NOT a water user on one of the projects of the U. S. Reclamation Service, but wish to receive the RECLAMATION RECORD each month.

I inclose herewith 75 cents for a year's subscription beginning with the current issue.

(Name.)

(Street and number.)

(City and State.)

(Write plainly.)

NOTE.—Send money order or New York draft, made payable to Special Fiscal Agent, U. S. Reclamation Service. Do NOT send stamps.

Cost-of-production records are of fundamental importance to the whole program of agricultural research and education, because they furnish data for analyzing the farm business.

ENGINEERS AND DRAFTSMEN WANTED.

United States Civil-Service Examinations.

The United States Civil Service Commission announces open competitive examinations for the positions of irrigation engineer, \$2,400 or over a year; civil engineer, \$2,400 or over a year; assistant irrigation engineer, \$1,500 to \$2,280 a year; assistant civil engineer, \$1,500 to \$2,280 a year; junior irrigation engineer, \$1,200 to \$1,440 a year; junior civil engineer, \$1,200 to \$1,440 a year; engineering draftsman, \$1,200 to \$2,400 a year. Vacancies in the Reclamation Service, at the salaries indicated, and in positions requiring similar qualifications, at these or higher or lower salaries, will be filled from these examinations, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer, or promotion.

On account of the needs of the service, papers will be rated as received and certification made as the needs of the service require. In the absence of further notice applications for these examinations will be received by the commission at Washington, D. C., until the hour of closing business on August 1, 1921. If sufficient eligibles are obtained the receipt of applications may be closed before that date, of which due notice will be given.

Competitors will not be required to report for examination at any place, but will be rated on the following subjects, which will have the relative weights indicated:

Engineer and assistant engineer.

SUBJECTS.

	Weights.
1. Education, general experience, and fitness-----	70
2. Thesis, specimens of work, or responsible experience in irrigation or civil engineering-----	30
Total -----	100

Junior engineer.

SUBJECTS.

1. Education, experience, and fitness-----	70
2. Specimen of drawing and lettering (to be filed with application) -----	30
Total -----	100

Engineering draftsman.

SUBJECTS.

1. Education and experience-----	60
2. Drafting (rated on samples of work filed with application) -----	40
Total -----	100

Applicants should at once apply for Form 1312, stating the title of the examination desired, to the Civil Service Commission, Washington, D. C.; the secretary of the United States Civil Service Board,

Customhouse, Boston, Mass., New York, N. Y., New Orleans, La., Honolulu, Hawaii; Post Office, Philadelphia, Pa., Atlanta, Ga., Cincinnati, Ohio, Chicago, Ill., St. Paul, Minn., Seattle, Wash., San Francisco, Calif., Denver, Colo.; Old Customhouse, St. Louis, Mo.; Administration Building, Balboa Heights, Canal

Zone; or to the chairman of the Porto Rican Civil Service Commission, San Juan, P. R.

Applications should be properly executed, excluding the medical and county officers' certificates, and filed with the Civil Service Commission, Washington, D. C., without delay.

IRRIGATION STATISTICS, FOURTEENTH CENSUS.

The Director of the Census announces, subject to correction, the following preliminary figures for irri-

gation in the United States, excluding that for rice, in the Gulf States.

States.	Acreage to be irrigated by works either completed or under construction.		Acreage irrigated.			Acreage to which existing works are capable of supplying water.	
	1920	1910	1919	1909	Per cent of increase. ¹	1920	1910
Total.....	33,598,699	31,114,625	18,218,549	13,741,570	32.6	24,033,644	19,337,835
Arizona.....	813,153	944,090	467,565	320,051	46.1	627,303	387,655
California.....	7,204,366	5,490,360	4,095,247	2,664,104	53.7	3,486,929	3,619,378
Colorado.....	5,220,588	5,917,457	3,348,385	2,792,032	19.9	3,815,348	3,990,166
Idaho.....	3,780,048	3,549,573	2,488,806	1,430,848	73.9	3,092,810	2,388,959
Kansas.....	102,562	161,300	47,312	37,479	26.2	67,853	139,995
Montana.....	4,358,148	3,515,602	1,687,031	1,679,084	.5	2,639,082	2,205,155
Nebraska.....	705,775	688,616	391,350	259,035	51.1	482,747	432,363
Nevada.....	1,368,655	1,232,142	564,211	701,833	-19.6	676,575	840,962
New Mexico.....	945,981	1,102,297	543,343	461,718	17.7	693,812	644,970
North Dakota.....	57,476	38,173	12,072	10,248	17.8	34,235	21,917
Oklahoma.....	11,742	8,528	2,969	4,388	-32.3	9,372	6,397
Oregon.....	1,915,368	2,527,208	982,060	686,129	43.2	1,309,112	830,526
South Dakota.....	177,345	201,625	100,840	63,248	59.4	125,022	128,481
Texas.....	1,081,982	753,089	375,741	164,283	128.7	836,374	340,641
Utah.....	2,359,244	1,947,625	1,371,651	999,410	37.2	1,700,558	1,250,246
Washington.....	836,795	817,032	529,899	334,378	58.5	637,151	470,514
Wyoming.....	2,664,471	2,224,298	1,209,527	1,133,302	6.7	1,799,361	1,639,510

¹ A minus sign (—) denotes decrease.

The results of cost-of-production studies on a number of farms where a given type of farming is practiced are useful not only to the farmers on whose farms the results are obtained but are of value in showing other farmers how to improve their methods.

From the standpoint of the individual farmer, the primary purposes of cost-of-production studies are to record the details of the farm business for reference, to give an insight into the elements and interrelations of the different farm activities, to furnish information that may enable the farmer to reduce costs or otherwise increase profits, and to make possible a comparison of the profitableness of the different enterprises and combinations of enterprises.

Cost-of-production studies are one of the means of providing the basic facts needed by legislators and price commissions in comparing the profits of competing lines of production and estimating necessary price.

From the standpoint of the public, cost-of-production studies provide the facts which give a basis for intelligent judgment upon the probable effects of any given legislation or other public activity upon the farmer as a producer and as a citizen.

One of the fertile sources of loss in potato storage are poor and disease-infested cellars. The cellar should be cleaned out and fumigated every spring after potatoes and other stored articles have been removed.

ANNUAL WATER CHARGES ON FEDERAL IRRIGATION PROJECTS, SEASON OF 1921.

[Compiled by Frank J. Bergin, Counsel, Washington Office.]

Projects.	Minimum charge per acre.	Number of acre-feet delivered for minimum charge.	Acre-foot charge in flood season.	Acre-foot charge not in flood season.	Acre-foot charge at all times.	Charge for additional water per acre-foot.	Charge for first acre-foot additional.	Charge per acre-foot for additional water in excess of 3 acre-feet.	Date charges were fixed by public notice or order.
Belle Fourche ¹	\$2.00		\$0.75	\$1.50					Mar. 1, 1920
Blackfeet (Indian). R.....	1.00	1½				\$0.50			Apr. 17, 1920
Boise ²	1.50		.50	.70					Feb. 18, 1921
New York water-right land.....	.75	1				.70			
Carlsbad.....	2.00	2					\$0.50	\$0.75	Feb. 20, 1920
Lands outside project. R.....					\$1.55				Apr. 22, 1921
Flathead (Indian). R.:.....									
Jocko Valley Division.....					.75				Jan. 29, 1920
All other lands.....					1.00				
Fort Peck (Indian). R.....	1.00	1½				.75			Mar. 24, 1920
Grand Valley. R.....	2.00	2				1.00			Feb. 21, 1921
Huntley.....	4.00		1.75	2.50					Feb. 14, 1921
Klamath.....	2.00	2					.50	.75	Feb. 25, 1920
Milk River. ³ R.:.....									
Upper Valley—Private canals.....	.50	1				.50			Mar. 26, 1921
Lower Valley—Land subject to reclamation law.....					2.00				Apr. 18, 1921
Lower Valley—Land not subject to reclamation law.....					5.00				Mar. 26, 1921
Minidoka.....	2.00		.60	1.30					Feb. 18, 1921
Newlands ⁷	\$1.65	1½				.80			Feb. 25, 1921
North Platte.....	2.80	2				1.40			Mar. 3, 1921
Lands not under public notice. ¹⁰ R.....	1.70	2				1.00			
Okanogan.....	4.00	1					1.50		Do.
Lands outside irrigation district.....	6.00								
Orland.....	2.00	3						12.25	Feb. 20, 1920
Rio Grande. R.....	12.00	2					1.00	1.25	Feb. 28, 1921
Shoshone.....	1.75	1½				.50			Feb. 14, 1921
Strawberry Valley:									
Spanish Fork and Lake Shore Divisions.....	.90	14 1				15.90			Feb. 15, 1921
High Line Division.....	1.80	2				15.90			
Power Canal Division.....	2.50	2							
Sun River:									
Fort Shaw Division.....	2.50	1½				.50			Feb. 25, 1921
Greenfields Division. R.....					1.25				
Umatilla:									
East Division.....	2.25	10 4					17.75		Apr. 25, 1921
West Division.....	2.00	18 4½					17.75		Do.
Uncompahgre. ¹⁹ R.....									Feb. 15, 1921
Yakima:									
Tieton Division.....	2.00		1.00	1.75					Feb. 19, 1921
Sunnyside Division.....	2.00	20 2				.75			Mar. 3, 1920
Yuma.....	3.50	2				2.00			Feb. 6, 1920

R. designates project or portion thereof under rental basis. All others under public notice.

¹ Operation and maintenance charges to cover repairs on Belle Fourche Reservoir are additional to above charges.

² Special charge for drainage, in addition to above charges, is \$1 per irrigable acre per year; stock and domestic water delivered outside of irrigation season will be \$2 per acre-foot.

³ 1 acre-foot after July 1.

⁴ An additional charge of 15 cents an acre-foot will be made for water used in the winter season.

⁵ Not to exceed 2½ acre-feet; 2 acre-feet at \$1.55 per acre-foot and the additional ½ acre-foot for 50 cents.

⁶ For water delivered in the river at pumping plants a charge of 50 cents per acre will be made for lands subject to reclamation law and \$1 per acre for lands not subject thereto.

⁷ Above charges do not cover the water service through stock-water supply pipes in Fernley District.

⁸ A charge of \$1.50 per irrigable acre will be made for any water in addition to 3 acre-feet per irrigable acre furnished to vested-right land for which the contract adjusting the vested acreage provides that the United States is to deliver not to exceed 3 acre-feet at a charge of 40 cents per acre.

⁹ 3 acre-feet is furnished for minimum charge to lands of the Fernley and Hazen benches.

¹⁰ Water will be furnished lands covered with privately built systems at 85 cents per acre-foot; excess water from Pathfinder Reservoir will be 50 cents per acre-foot; the estimated cost of operation and maintenance of Pathfinder Reservoir for 1921 is announced at \$3,000.

¹¹ Further quantities will be \$3 per acre-foot.

¹² 25 cents per acre-foot for first 3 additional acre feet and 50 cents per acre-foot for further quantities.

¹³ 50 cents per acre in addition to the above on areas not now subject to construction repayment, for the use of reservoir water for the season \$1.25 per acre, including 50 cents per acre for reservoir charge, for storage water furnished to canals within the project limits where operation and maintenance is carried on by the owners thereof; \$4 per acre or any fractional part thereof, for stored water for areas situate within the corporate limits of cities or towns, provided that not more than one delivery gate is required; if more than one delivery gate is required, the charge to be \$8 per acre. Such areas when amounting to over 3 acres to be charged at the regular farm rate, provided only one delivery gate is used. The rate for the temporary rental of surplus water to lands known as the Fort Hancock area will be \$2.25 per acre for not to exceed 3 acre-feet.

¹⁴ Not more than the amount of water per acre specified in the water-right application.

¹⁵ The 90 cents per acre-foot will be for additional water to lands covered by water-right application or contract; for all additional water not covered by water-right application or contract a charge of \$1.50 per acre-foot will be made.

¹⁶ Sandy area entitled to 7 acre-feet.

¹⁷ Additional quantities \$1 per acre-foot, but lands seeded during the current irrigation season to alfalfa for the first time will be furnished additional water for 25 cents per acre-foot.

¹⁸ For lands in the Boardman and Kern districts, except lands in the Juniper Canyon area, the minimum charge will entitle water user to 3 acre-feet.

¹⁹ Rental charge for water is as follows: \$105 per second-foot for project water; \$30 per second-foot for water furnished to small canals which have agreed to unify and operate their own systems; \$30 per second-foot for water furnished the Ouray Ditch; \$105 per second-foot for the diversion of water for the Chipeta-Beaudry Ditch; \$105 per second-foot for the carriage of priority water in project canals. For carrying water appurtenant to stock in certain ditch companies, the rates will remain as heretofore; Ironstone, \$5 per share; Ironstone Extension, \$3 per share; Delta Chief, \$2 per share; Home Run, \$1.50 per share; and Chipeta, 25 cents per share. The charges for delivering water accruing to outstanding water deeds are fixed in the respective deeds. The charge for furnishing supplemental water will be such as to make the cost of a full supplemental supply, including the charge stated in the water deed, the same as for project water; that is, \$105 per second-foot.

²⁰ Minimum charge will permit delivery of not more than the following amounts per irrigable acre: To lands of Class (A), 2 acre-feet; to lands of Class (B), 2½ acre-feet; to lands of Class (C), 3 acre-feet. The division of the lands into the three classes named, that is, (A), (B), and (C), is made by the Sunnyside Valley Irrigation District and a map showing such classification is on file in the office of the project manager and in the office of the irrigation district. For newly-reclaimed lands no charge will be made for water actually needed in excess of the amount covered by a charge of \$2 per irrigable acre at the said rates.

MONTHLY PROGRESS REPORTS FOR MARCH, 1921.

Monthly conditions of principal Reclamation Service reservoirs for March, 1921.

[Elevation above sea level.]

State and project.	Reservoir.	Available capacity, in acre-feet.	Elevation.		Storage in acre-feet.			Out-flow in acre-feet.	Elevation of water surface.		
			Spill-way crest. ¹	Lowest gate sill. ²	Begin-ning of month.	End of month.	Maxi-mum.		Begin-ning of month.	End of month.	Maxi-mum.
Arizona, Salt River.....	Roosevelt ³	1,305,000	2128	1903	896,194	834,126	896,194	.....	2097.08	2092.51	2097.08
California, Orland.....	East Park.....	51,000	1199.68	1111.68	48,700	50,830	50,830	3,900	1198.41	1199.59	1199.59
Idaho:											
Boise.....	Arrowrock.....	280,000	3211	2956	135,400	221,080	237,460	109,360	3152.2	3190.8	3197.1
	Deer Flat.....	177,000	2518	2482	123,876	163,282	163,282	.....	2512.02	2516.55	2516.55
Minidoka.....	Lake Walcott.....	95,180	4245	4236	84,940	85,400	87,030	412,611	4244.12	4244.16	4244.39
	Jackson Lake.....	847,000	6769	6730	393,110	322,830	322,830	660	6745.88	6746.80	6746.80
Montana:											
Milk River.....	Nelson.....	25,000	2214	2200	17,000	17,000	17,000	.....	2208.3	2208.34	2208.3
St. Mary Storage.....	Sherburne.....	33,000	4788	4720	.....	.....	.....	.....	.....	.....	.....
Sun River.....	Willow Creek.....	16,700	4136	4085	12,878	13,355	13,355	.....	4126.0	4126.5	4126.5
Nebraska-Wyoming, North Platte.....	Pathfinder.....	1,070,000	5552	5670	741,950	839,870	839,870	6,940	5835.10	5840.75	5840.75
	Lake Alice.....	11,400	4182	4159	5,630	5,065	5,630	.....	4173.5	4172.4	4173.5
	Lake Minatare.....	6,0700	4125	4074	47,243	46,465	47,243	.....	4118.4	4118.0	4118.4
Nevada, Newlands.....	Lake Tahoe.....	120,000	6230	6224	.....	.....	.....	.....	6224.98	6225.18	6225.18
	Lahontan.....	290,000	4162	4060	154,780	166,160	166,160	14,034	4146.70	4148.60	4148.60
New Mexico:											
Carlsbad.....	McMillan.....	45,000	3267.7	3241.6	33,750	31,250	33,750	.....	3265.7	3265.2	3265.7
Rio Grande.....	Elephant Butte.....	2,638,800	4407	4321.5	1,731,820	1,706,587	1,731,820	95,400	4381.20	4380.4	4381.20
Oregon, Umatilla.....	Cold Spring.....	50,000	621.5	560	49,650	49,200	49,650	193	621.24	620.98	621.24
Oregon-California, Klamath.....	Clear Lake.....	462,000	4540	4514	348,000	404,000	404,000	.....	4535.6	4537.8	4537.8
South Dakota, Belle Fourche.....	Belle Fourche.....	203,000	2975	2920	172,380	184,970	184,970	.....	2970.9	2972.6	2972.6
Utah, Strawberry Valley.....	Strawberry.....	250,000	7558	7517	206,200	209,740	209,740	.....	7551.9	7552.4	7552.4
Washington:											
Okanogan.....	Conconully.....	14,400	2290	2232	1,914	2,221	2,221	.....	2254	2256	2256
Yakima.....	Bumping Lake.....	34,000	3126	3389	10,280	3,820	10,280	6,460	3403.9	3394.9	3403.9
	Lake Clealum.....	22,800	2134	2122	26,985	26,245	27,030	785	2135.3	2134.9	2135.32
	Lake Kachess.....	210,000	2258	2192	185,435	165,800	186,575	20,775	2249.7	2245	2250.05
	Lake Keechelus.....	152,000	2515	2425	104,835	94,545	106,215	11,670	2494.2	2494.2	2494.95
Wyoming, Shoshone.....	Shoshone.....	456,600	5360	5132.3	276,877	216,642	276,877	80,447	5328.3	5374.6	5328.3

¹ Or maximum storage.² Or zero storage.³ Zero water depth at elevation 1902.2.⁴ Amount of silt shown by silt survey deducted from original capacity.⁵ Proposed regulation.⁶ Estimated low-water limit under proposed plan of regulation.

SALT RIVER PROJECT, ARIZONA.

Operation and maintenance of irrigation system.—Water was run continuously in all of the canals during March, with the exception of the Maricopa Canal, as the water was out of this canal for three days for cleaning purposes. The demand for irrigation water service is steadily increasing.

Three regular maintenance crews were employed in the field the full month. A fourth crew was employed from March 8 and a fifth crew from the 15th, in addition to a three-man crew. An extra crew of 670 man days was used the first three days of the month in cleaning 10 miles of the Maricopa Canal. The average number of men and stock employed by all the crews and the work accomplished is shown in the following statement: Average number of men, 163; average number of stock, 10½; miles main canals cleaned, 20½; miles laterals cleaned, 108½; number of new structures installed, 11; number of old structures repaired, 190; riprap placed, 2,924; dry masonry placed, three-fourths cubic yard; dirt fill placed, 825 cubic yards; concrete placed, 4½ cubic yards; 18-inch corrugated pipe placed, 90 feet; 24-inch corrugated pipe placed, 497 feet; 24-inch concrete pipe placed, 88 feet; 30-inch corrugated pipe placed, 20 feet; new laterals constructed, 1½ miles.

Work on the Laveen drain was completed on March 15. The Austin trencher completed 3,177 linear feet in 7 working days. In connection with this work, 4,108 linear feet of 12 and 10 inch pipe were laid, 6

manholes completed, 4,308 linear feet of gravel back fill placed, and 4,727 linear feet of earth back fill placed. A daily average of 12 men and 7 head of stock was employed for 30 days.

Operation of power system.—The total power generated during the month was 6,957,830 kilowatt hours. The Roosevelt power plant operated continuously during the month and generated 4,632,000 kilowatt hours. The ice plant was placed in service during the month. The Cross Cut plant operated continuously and generated 1,145,500 kilowatt hours. Exciter Unit No. 1 was overhauled, new nozzles were installed, also new bearing pins in the governor rigging, and the water-wheel guide bearing was rebabbitted. The Arizona Falls plant operated continuously and generated 339,150 kilowatt hours. The South Consolidated plant operated 99.7 per cent of the month, being shut down for a short time while sluicing the South Canal. This plant generated 498,200 kilowatt hours. The Chandler plant operated 99.9 per cent of the month, being shut down for 1.42 hours for adjustment of bearings. This plant generated 342,980 kilowatt hours. The substations all operated during the month without trouble. The overload relays on the Glendale line switch at the Phoenix substation were repaired, reinstalled, and adjusted.

The pumping plants were all operated as required.

Construction.—Meters were installed at the plants of the following customers: E. W. Samuells, McIntyre & Davie, E. F. McCombs, Miller Ranch, H. W. Strangman's Ranch No. 3.

At the Highline pumping plant the foundations for the motors for Units Nos. 1, 2, and 3 were enlarged, thus providing the proper foundation for the setting of the new motors.

At Roosevelt the generator for Unit No. 4 was re-wound with the new coils, thereby increasing the rating of this unit to 1,350 KVA. This armature was assembled on the water wheel of Unit No. 3 and dried out.

Office.—A total of 186,256 acres was entitled to irrigation water service on the first of the month.—C. C. Cragin.

YUMA PROJECT, ARIZONA-CALIFORNIA.

March weather conditions were favorable and crop prospects good; the first cutting of alfalfa was begun. Prices for farm products remained low. A board, the members of which represented the California Railroad Commission, the Arizona Corporation Commission, the consumers, and the Southern Sierras Power Co., met at Yuma March 29 to make a report in connection with increased rates to the power company. The Somerton State Bank failed to open on March 28.

The Bucyrus dragline advanced 0.40 mile along the east drain, excavating 23,100 cubic yards of earth. Monighan dragline No. 2 began the construction of the south drain, advancing 0.40 mile and excavating 10,100 cubic yards.

Sixteen thousand acre-feet of water were delivered to users. Ruth dredger No. 6 on the Indian Reservation cleaned 5.3 miles of laterals, excavating 5,200 cubic yards of silt; in the Yuma Valley three Ruth dredges cleaned 14.25 miles of laterals, excavating 12,500 cubic yards of silt.

The maximum discharge of the Colorado River was 21,000 second-feet; minimum 7,100 second-feet. On March 31 the gage height was 17.25 with a discharge of 14,300 second-feet. The total discharge for the month was \$25,000 acre-feet.

The final report of the soil survey, Imperial Valley investigations, was finished; this completes the work contemplated at the present time.

C. C. Fisher, engineer, completed the Arizona cooperative work and left March 16 for Boise, Idaho.

Official visitors were W. A. Meyer, examiner of accounts; L. N. McClellan, engineer, of the Denver office; and Assistant Chief Engineer R. F. Walter.—Porter J. Preston.

YUMA AUXILIARY PROJECT, ARIZONA.

March weather conditions were favorable for construction work. The crushing plant at the Mesa quarry was operated continuously during the month. A well for camp and construction water supply was put down and a fair water supply was obtained. Some construction equipment for concrete-pipe manufacturing plant was received during the month.

Work on the B lift pumping plant was carried on during the month. One hundred and eighty cubic yards of concrete were poured, the building being completed up to and including the pump floor. Excavation was made for the spillway and sluiceway and the supply canal constructed for about four stations to connect the building forebay with that portion built under contract. Excavation is being made for the 6-foot force main. Collapsible forms are being made for the construction of this pipe.

Monighan drag-line excavator No. 1 was moved from near Somerton to the Donovan Drop on the

Crop report, Yuma project, Arizona-California, 1920.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Average per acre.
Alfalfa hay.....	13,000	Ton.....	28,862	2.22	\$19.34	\$558,160	\$42.93
Alfalfa seed.....	9,630	Pound.....	2,396,013	244.00	.27	646,920	65.81
Barley.....	130	Bushel.....	2,489	19.3	1.22	3,040	23.56
Corn sorghum.....	2,300	do.....	63,200	27.5	1.13	71,330	31.02
Corn fodder.....	84	Ton.....	118	1.4	17.54	2,070	24.64
Cane sugar.....	12	do.....	540	45.00	20.00	10,800	900.00
Cotton, S. S.....	27,600	Pound.....	9,870,000	353.00	.14	1,381,800	50.07
Cotton, L. S.....	10,000	do.....	1,378,000	139.00	.56	771,680	77.17
Cotton seed.....		Ton.....	13,000		15.00	195,000	5.19
Fruit.....	110	Acre.....				10,600	97.29
Garden.....	206	do.....				23,180	112.53
Hay, other.....	142	Ton.....	253	1.8	14.09	3,560	25.07
Pasture.....	1,815	Acre.....			25.00	45,400	25.00
Wheat.....	51	Bushel.....	888	17.41	2.70	2,400	47.06
Estimated additional revenue derived from pasturing stalk lands and feeding alfalfa straw.....						45,000	
Less duplicated areas.....	10,800						
Total cropped.....	54,480		Total and average.....			3,770,940	69.20
			Areas.		Acres.	Farms.	Per cent of project.
Irrigated, no crop: New land.....			Total irrigable area farms reported..		60,000	1,230	97
			Total irrigated area farms reported..		54,550		88
			Under water right applications.....		37,994	673	61
			Under rental contracts.....		16,556	557	27
Total irrigated.....	54,550		Total cropped area farms re- ported.....		54,484		88

Project East Main Canal, and the Bucyrus 30-B was moved from the Yuma yards to the drop at Station 174, East Main Canal, and will start excavation on April 1.

Office engineering was confined to routine work on construction now being carried on.

Labor was plentiful for the work being done.—*Porter J. Preston.*

Prevailing crop prices at close of March, 1921.

Project.	Alfalfa hay, per ton.		Barley, per bushel.	Oats, per bushel.	Wheat, per bushel.	Potatoes, per bushel.
	In stack.	Baled at ship- ping point.				
Salt River.....	\$10-14	\$16-20				
Yuma.....	6.00	10.00				
Orland.....	18.00	25.00	\$0.60		\$1.38	
Grand Valley.....	8-10	14.00	1.25	\$0.70	1.25	\$0.75
Uncompahgre.....	5-9		1.50	.60	1.05	.70
Boise.....	5.00	10.00	.55	.65	1.35	.45
King Hill.....	9.00			.64		.75
Minidoka.....		8.00	.60		1.02	.45
Huntley.....	6.00	10.00			1.00	.90
Milk River.....	10.00	15.00	.62	.16	1.25	1.50
Sun River.....	7.50	12.00	.50	.65	1.27	.50
Lower Yellowstone.....	12.50		.90	.70	1.28	1.00
North Platte.....	5.00		.50	.30	1.40	.50
Newlands.....	8.00	12.00				
Carlsbad.....		12-18				
Rio Grande.....		24.00		.65	1.90	
North Dakota pumping.....	15.00			.63	1.16	1.25
Umatilla.....		12.00				
Klamath.....	15.00	25.00	.60	.48	1.35	1.65
Belle Fourche.....	1 to 6	10.00	.72	.53	1.65	1.20
Strawberry Valley.....	12-14	16.00	.85	.50	1.20	1.50
Okanogan.....	20.00	24.00				1.00
Yakima:						
Sunnyside unit.....	10.00	14-16				.60
Tieton unit.....	10.00	14-16				.60
Riverton.....				.90	.87	.69
Shoshone.....	5-6					
Indian projects:						
Blackfeet.....	10.00		.24	.13	1.04	
Flathead.....	12.00	17.00		.48	1.13	.36
Fort Peck.....	10.00	13.00		.31	1.16	1.50

ORLAND PROJECT, CALIFORNIA.

Unusually favorable weather for March prevailed throughout the month. The rainfall was 1.75 inches, which is about 0.80 inch below the average for the month. The total rainfall for the season at the close of the month was 19.67 inches, about 2 inches in excess of the average seasonal rainfall. Flashboards were placed on the East Park spillway crest on the 15th, prior to which date 3,900 acre-feet of water were allowed to run to waste. Three thousand seven hundred square yards of concrete lining were placed when the work was indefinitely suspended by order of the directors of the water users' association on March 4. Ten minor structures were built. The two-line steel flume of the Highline Canal was cleaned and given a double coating of coal tar. All gate lifts and other iron structures, including operating and construction machinery, were painted. Seventeen miles of laterals were cleaned and repaired, nearly completing the work for the season.

Water was turned into the South Canal on the 6th and a small amount was used throughout the month for testing land and planting orchards and vineyards. The amount of development work in progress on the

farms was very encouraging. Owing to the unusually warm and favorable weather conditions all crops were well advanced.—*A. N. Burch.*

GRAND VALLEY PROJECT, COLORADO.

March weather was warm and dry, and conditions were favorable for construction and maintenance work as well as for farming operations. Labor was plentiful.

The farmers made good progress in preparing their land and planting crops. A considerable acreage was seeded to spring grains and sugar beets, and planting was in full swing at the end of the month. The prices of farm products showed little improvement. Alfalfa hay was held at \$10 per ton, with very little demand.

Maintenance work consisted of cleaning laterals, burning weeds, and miscellaneous jobs required to get the system in good condition for the season's operations. On account of the dry weather and the urgent demand for water for stock and domestic use, a small head was turned into the main canal on March 15, and deliveries were made thereafter to all water users requiring water for these purposes, but no irrigation water was delivered during the month.

Good progress was made on drainage construction, with two drag lines working on project lands and two in the Grand Valley drainage district. Two and four-tenths miles of drain were completed, involving 65,000 cubic yards of excavation.—*S. O. Harper.*

UNCOMPAHGRE PROJECT, COLORADO.

March weather was ideal for brushing canal banks and the usual maintenance work. It is estimated that the season is from two to three weeks ahead of the normal. Quite a little acreage was planted to potatoes and onions, and a demand developed the latter part of the month for irrigating water.

The P. & H. drag line completed the excavation of about 450 yards at the Ironstone Headworks, and then moved to the cleaning work on the Montrose and Delta Canal between mile posts 2 and 4, where 1,250 yards were removed.

The work of leveling and underpinning the concrete pier and the realignment of the West Canal plate girder flume over the Uncompahgre River was completed.

Several minor structures were installed on the D. E. Lateral of the Loutsenhizer Canal system.

Labor continued plentiful despite the increasing demand on account of farm work.—*L. J. Foster.*

BOISE PROJECT, IDAHO.

Weather.—Mild, clear weather prevailed during March. The precipitation was about 0.59 of an inch below normal.

Labor conditions.—There was little change in labor conditions from the previous month. A large number of men remained unemployed, with very little new work in sight. There was a slight decrease in the wage scale of both common and skilled laborers.

Farming operations.—Plowing and seeding of small grain were nearly completed. A large acreage of alfalfa had been plowed under and seeded to grain and a few early potatoes were planted. Sheep shearing was begun. Both cattle and sheep began moving toward the summer range. Little hay was moved and the carry over on this crop will be heavy.

Water supply.—The run-off from the Boise River drainage area during March was 59 per cent greater

than normal. From reports on snow conditions in the mountains, there will apparently be a good water supply for irrigation.

Operation and maintenance.—A large force of men and teams was employed in preparing the canal system for operation. Concrete lining was placed on several sections of the Deer Flat Lowline Canal, where serious erosion was taking place. Laterals were cleaned and structures that required repairing were put in shape. No water was used for irrigation, but stock water was delivered in several sections. Water was run through the Main Canal for filling Deer Flat Reservoir.

Construction.—The contractors on the Notus Canal and lateral system made good progress and should complete their work early next month. Concrete lining on the section through Caldwell was resumed with Government forces. The work on the entire system is drawing to a close and it is expected the canals will be ready for water early in April.

A small amount of construction work was under way on laterals of the New York Canal Co. stockholders that had been turned over to the United States.

Drainage.—No excavation was in progress. A few minor structures were installed on the drainage system in the Riverside and Big Bend Irrigation Districts. In the west end of the project surveys were begun in the water-logged areas and borings made to determine the formation underlying these areas.

Surveys.—Location for the first 4 miles of the proposed Hillcrest Canal was run and test pits were dug. Lines and grades were given for the construction

work in progress. Minor structures were staked out and laterals run to take care of new lands in the portion of the project under operation.

Visitors.—C. A. Lyman, of the Washington office, was at project headquarters March 23 to 29; J. M. Gaylord, electrical engineer, Barry Dibble, project manager Minidoka project, and S. L. Sinclair, of the Minidoka project, were at Boise on the 30th and 31st in connection with the Boise River power plant.—*J. B. Bond.*

KING HILL PROJECT, IDAHO.

March weather was favorable for construction work and labor was plentiful.

At Camp 6 a small force was engaged three days replacing three joints in the McEachern Concrete Flume, which work was about 30 per cent completed on March 31.

At Camp 9 work was resumed March 1, and on March 17 the Greer Concrete Flume and lining as originally planned was completed. It was decided to replace the old flume between stations 1308 and 1310+26 with a combination flume and lining, which work was completed March 31. A small crew working from this camp cleaned and repaired the gunite flume. Fifty feet of the gunite flume floor was given a half-inch coating of 1:2 concrete mixture reinforced with poultry netting.

At Camp 10 one man with two teams completed the backfill at the outlet of Tuanna Siphon.

Four trucks were employed throughout the month hauling equipment from the camps to King Hill.

Crop report, South Side Pumping Unit, Minidoka Project, Idaho, 1920.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	18,354	Ton.....	52,518	2.9	\$9.00	\$472,660	\$25.75
Alfalfa seed.....	225	Bushel.....	751	3.3	9.00	6,360	28.26
Apples.....	99	Pound.....	49,135	495	.024	1,223	12.40
Barley.....	834	Bushel.....	30,036	36.2	.80	24,030	28.81
Beets.....	4,257	Ton.....	41,378	9.7	12.00	496,536	116.64
Beans.....	5	Bushel.....	65	13	3.00	195	39.00
Clover.....	109	Ton.....	163	1.5	8.00	1,304	12.00
Clover seed.....	760	Bushel.....	2,869	3.8	12.00	34,430	45.30
Corn.....	84	do.....	930	11.1	1.00	930	11.07
Corn fodder.....	44	Ton.....	167	3.8	5.00	835	19.00
Fruits, small.....	12	Acre.....	.....	.....	.....	1,175	98.00
Garden.....	324	do.....	.....	.....	.....	25,295	78.00
Hay.....	30	Ton.....	27	0.9	5.00	135	4.50
Mangles.....	10	do.....	137	13.7	5.00	685	68.50
Onions.....	5	Bushel.....	1,700	340	1.00	1,700	340.00
Oats.....	1,724	do.....	58,330	33.8	.45	26,250	15.22
Pasture.....	2,114	Acre.....	.....	.....	.....	37,090	17.54
Potatoes.....	4,702	Bushel.....	1,192,792	254	.70	837,960	178.21
Peas.....	5	do.....	187	37.5	1.50	280	56.00
Rye.....	6	do.....	28	4.7	1.50	42	7.00
Wheat.....	9,367	do.....	297,861	31.8	1.60	476,580	50.88
Less duplicated areas.....	130	.....	.....	.....	.....	.....	.....
Total cropped.....	42,940	.....	Total and average.....	.....	.....	2,445,700	56.96

		Areas.	Acres.	Farms.	Per cent of project.
Irrigated, no crop:					
Nonbearing orchard.....	196	Total irrigable area farms reported..	48,448	915	99.9
Young alfalfa.....	1,794	Total irrigated area farms reported..	46,133	915	94.5
Young clover.....	160	Under water right applications.....	46,133	915	94.5
Miscellaneous.....	1,922	Under rental contracts.....	.....	.....	.....
Less duplicated areas.....	882	Total cropped area farms reported.....	42,938	915	87.3
Total irrigated.....	46,130	.....	.....	.....	.....

The Idaho Power Co. rebuilt 1,150 feet of the Malad Flume and repaired some 600 feet of the old flume.

The King Hill Irrigation District's maintenance force completed the reconstruction of the Hillstone Siphon.—*Walter Ward.*

MINIDOKA PROJECT, IDAHO.

March weather was warm and dry. Precipitation was only 0.37 inch, which is the lowest record for any March since 1914.

The work of cleaning canals and laterals on the South Side Pumping System was pushed vigorously, and by the end of the month was practically completed. A maximum of 13 crews, with 44 laborers and 48 teams, was employed on this work. On March 31 these numbers were reduced to 7 crews, with 28 laborers and 9 teams. The amount of work done in 1921 was almost double that of 1920 with an increase in cost of only 10 per cent. One structure crew was employed which during the month placed about 31 cubic yards of concrete in 12 minor structures. Several wooden structures were repaired.

Labor conditions were generally satisfactory. The supply was plentiful even at the reduced prices and the quality was good.

Overhauling of the South Side pumping stations was completed, and they were ready for operation at the end of the month.

Four of the five generators at the power house were operated during the month, No. 5 unit being overhauled and repaired.

The total power generated during the month was 3,403,060 kilowatt hours, as compared with 4,093,500 in March, 1920. The maximum load was 6,000 kilowatts, and the average 4,600, making a load factor of 76.7 per cent.

The maximum demand in kilowatts at the different substations during the month was as follows: Burley, 2,290; Rupert, 1,507; Heyburn, 135; Acequia, 17; Declo, 49; Albion, 275; Paul, 220; Unity, 46; Riverside, 19; East End, 23; and Central, 8.

The B-1 transmission line from the dam to the pumping stations was restrung with No. 1 wires, the No. 5 wires being taken down for use on the line to Milner. Five cars of poles were received for this line.

Bids were opened on March 22 for building the extension to the Burley substation. Three bids were received, the lowest being by Overstreet & Cooper, of Burley, for \$2,896.89.

In response to requests from stockmen on the North Side a meeting was held at Burley on March 26 to discuss the matter of leasing withdrawn lands adjoining the project for grazing purposes. Although the attendance was light much interest was manifested, and it is probable that bids for leasing these lands will be called for in the near future.

Crop report, Gravity division, Minidoka project, Idaho, 1920.

[Data furnished by Minidoka Irrigation District.]

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Average per unit of yield.	Total.	Average per acre.
Alfalfa hay.....	28,568	Tons.....	98,464	3.5	\$9.00	\$886,176	31.02
Alfalfa seed.....	484	Bushel.....	1,770	3.7	9.00	15,986	32.90
Apples.....	139	do.....	11,784	84.7	1.50	17,676	127.08
Barley.....	1,102	do.....	39,639	36	.80	31,711	28.77
Beans.....	29	do.....	460	16	3.00	1,380	48.04
Beet sugar.....	3,943	Tons.....	34,098	8.7	12.00	409,178	103.77
Beets, mangle.....	9	do.....	88	9.8	5.00	440	48.88
Clover hay.....	846	do.....	1,523	1.8	8.00	12,187	14.40
Clover seed.....	1,245	Bushels.....	4,744	3.8	11.40	54,084	43.42
Corn, Indian.....	799	do.....	23,922	29.9	1.00	23,923	29.94
Corn fodder.....	194	Tons.....	1,491	7.68	5.00	7,455	38.43
Small fruit.....	20	Pounds.....	127,752	6,308.7	.03	3,832	189.26
Garden.....	656	do.....		79.47		52,170	79.47
Common hay.....	202	Tons.....	421	2.1	5.00	2,108	10.43
Oats.....	3,463	Bushels.....	141,088	40.8	.45	63,490	18.33
Onions.....	36	do.....	4,515	127.2	1.00	4,515	127.18
Pasture.....	5,054	do.....				66,716	13.20
Potatoes.....	1,917	Bushels.....	332,395	173.4	.70	232,677	121.37
Rye.....	132	do.....	1,736	13.2	1.50	2,604	19.73
Wheat.....	7,644	do.....	240,259	31.4	1.60	384,414	50.29
Miscellaneous.....	32	do.....				1,688	52.84
Less irrigated, but no crop.....	406						
Less duplicated areas.....	468						
Total cropped.....	55,640	Total and average.....				2,274,360	40.90
		Areas.			Acres.	Farms.	Per cent of project.
Irrigated, no crop:							
Nonbearing orchard.....	379						
Irrigated, no crop.....	406						
Young alfalfa.....	3,697						
Fall plowed and miscellaneous.....	2,450	Area occupied by town sites.....			615		
Less duplicated areas.....	1,052	Total irrigable area farms reported.....			71,477	1,514	
		Total irrigated area farms reported.....			61,520		85.4
Total irrigated.....	61,520	Under water-right applications.....			72,093		
		Total cropped area farms reported.....			55,640		77.2

Shipments of farm products were not so heavy in March as in February, being 407 cars, as compared with 560. There were 116 cars of hay, 26 of grain and flour, 120 of potatoes, 27 of sugar, and 118 of live stock. Prices remained low.

Work at American Falls continued. One party ran 34 miles of secondary levels and 8 miles of levels to wells, making a total to date of 84 miles of primary and 261 miles of secondary levels. Topographic surveys were made of 25,350 acres of the reservoir basin, making a total to date of 74,286 acres and of 40 acres in detail of the dam site, 134 acres of the dam site having now been covered.

Classification of land was completed and covered, 37,160 acres, of which 840 acres was done in March. The number of contracts approved during the month was 19, involving \$32,433.50, and the number of purchases was 24, at a cost of \$25,585.16. The total number of purchases to date is 40, and the cost \$107,301.77. Investigations of ground water around the reservoir basin were begun, 44 holes and pipe wells being sunk to a total depth of 321 feet.

Sinking of test pits was completed. The total amount of material removed from these pits is 146.9 cubic yards. In addition test holes have been put down with soil augers to a total depth of 1,505.8 feet.

The project manager and engineer, F. A. Banks, met with the chief engineer at Salt Lake to discuss the work at American Falls.

Visitors at Burley included A. C. Cooley, in charge of Government demonstration agents on reclamation projects, and J. M. Gaylord, electrical engineer of Denver.—*Dana Templin.*

HUNTLEY PROJECT, MONTANA.

March weather was favorable for field work and the operation and maintenance crews were in the field the larger part of the month.

The No. 4 Austin drag line worked throughout the month on opening up a section of the tile drain No. 26. A total of 3,058 cubic yards was moved. One crew was employed in replacing deteriorated wood trap boxes on closed tile drains which were in bad shape and in some instances had already caved in. The new boxes are of timber, treated with coal tar or creosote, which it is thought will materially increase the life of the structures. New repair parts were received and placed in the hydraulic pumps, and this plant was practically in shape for operation.

The mild early spring was beneficial to the farmers on the project, a large amount of spring plowing and seeding having been accomplished. The lack of moisture was detrimental to this work, and unless a change comes in the near future, it will be necessary to open the irrigation season the latter part of April.—*Wm. M. Green.*

MILK RIVER PROJECT, MONTANA.

March weather in general was not very good for construction. The temperature was below normal and the precipitation was considerably above normal, consisting of about 11 inches of snow, the greatest at any time during the winter, which, however, was all gone at the end of the month. The snow on the St. Mary watershed in Glacier Park was reported above normal. Labor was plentiful, but farming operations were not commenced.

Surveys.—Bench level and farm unit surveys as well as surveys for lateral extensions were in progress.

Construction by contract.—Work was continued on lodging house at Saco.

Construction by Government forces.—Seven miles of operation and maintenance roads were completed, several checks, built last fall, were backfilled, and considerable work was done on fabricating small wooden structures in the yards.

Operation and maintenance.—The Dodson South Canal was opened on March 7, but closed again on account of snow and cold on the 11th, before any water had reached Nelson Reservoir. It was reopened on the 24th and during the balance of the month 3,500 acre-feet were diverted and 2,000 acre-feet delivered into Nelson Reservoir. The burning of weeds and other work preparatory to putting the canal systems into commission were in progress.—*Geo. E. Stratton.*

ST. MARY STORAGE DIVISION.

March weather was cold and stormy with exceptionally heavy snowfall in the mountains, where snow conditions were a trifle above normal for this time of year.

Caretakers were in charge of all camps, and no construction work was undertaken, work being confined to care of Government stock, repairs to harness, equipment, etc., and the moving of supplies and equipment from the camp at the head of St. Mary Canal, which is to be turned over to the Park Saddle Horse Co. on May 1.—*R. M. Snell.*

SUN RIVER PROJECT, MONTANA.

March weather was windy but favorable, with the exception of about one week from the 5th to the 12th, which was stormy and cold. A cold snap occurred also during the latter part of the month.

At Pishkun Reservoir a force of 16 men and 16 head of stock completed the rock paving of Dike No. 4, the drains from subsidiary pools into the main reservoir, and the wasteway into Quigley Coulee, with the exception of rock paving and backfill.

On the Fort Shaw Division from the 1st to the 4th a small head of water was run through the canal system for stock and domestic use. During the latter part of the month a small crew of men and teams was engaged in cleaning laterals and raising lateral banks. Two steel grain tanks were moved from Fort Shaw to Simms and one from Fort Shaw to Fairfield.

On the Greenfields Division two laterals were constructed and a number of concrete turnouts, wooden weirs, and culverts were installed. At Fairfield Camp concrete pipe for turnouts was made; concrete foundations for blacksmith shop and tool house built; addition to garage nearly completed; and a frame building to be used for a warehouse moved from Camp 16, placed on concrete foundation, and its remodeling begun.

All telephone lines were repaired.

Farmers were engaged in baling hay, marketing produce, and plowing. Carload shipments from the project consisted of 3 cars of wheat, 34 of hay, and 7 of potatoes. Demand for farm produce was light.—*Gco. O. Sanford.*

LOWER YELLOWSTONE PROJECT, MONTANA-NORTH DAKOTA.

On March 10 and 11 there was a snowstorm that could be called a blizzard, and about 12 inches of snow fell. This was followed by warm weather, which caused the snow to melt rapidly; and during the last few days of the month the weather and soil conditions on the high lands were favorable for farming operations.

The temperature was 3° above normal and the precipitation of 1.18 inches was nearly double the normal. Ice in the Yellowstone River moved over the dam at Intake on March 2, but, owing to the low stage of the river and thinness of the ice, no serious jams occurred.

Although some of the farmers were undecided as to what crop was best to plant for maximum cash returns, a greater part of them will follow the safe system of diversified farming. Much interest was manifested in growing into the potato industry.

The riprapping work on the Beef Slough Drain was completed on the 8th. Two men were engaged a greater part of the month in removing the willows in the main canal from mile 1.5 to 4.0. Repairing equipment preparatory for spring work was continued. On the 29th a small crew started on assembling wooden turnouts.—*L. H. Mitchell.*

Project-weather during March, 1912.

Project.	Station.	Temperature, ° F.			Precipitation (inches).
		Maximum.	Minimum.	Mean.	
Salt River.....	Phoenix, Ariz.....	95	41	64.7	0.03
Yuma.....	Yuma, Ariz.....	91	45	66.4	.09
Orland.....	Orland, Calif.....	78	38	54.7	1.75
Grand Valley.....	Grand Junction, Colo.....	75	23	43.2	.28
Uncompahgre.....	Montrose, Colo.....	74	13	44.2	1.11
Boise.....	Boise, Idaho.....	89	29	55.0	.60
King Hill.....	Glenns Ferry, Idaho.....	70	26	45.2	.84
Minidoka.....	Burley, Idaho.....	69	20	42.0	.37
Huntley.....	Ballantine, Mont.....	69	- 6	33.5	.65
Milk River.....	Malta, Mont.....	61	-23	20.4	1.47
St. Mary storage.....	Near Babb, Mont.....	59	-34	27.0	2.02
Sun River.....	Fort Shaw, Mont.....	68	- 9	31.8	.65
Lower Yellowstone.....	Savage, Mont.....	66	- 8	30.5	1.18
North Platte.....	Wynco, Wyo.....	82	10	42.6	.06
Newlands.....	Fallon, Nev.....	78	15	65.9	.07
Carlsbad.....	Carlsbad, N. Mex.....	88	27	56.6	.02
Rio Grande.....	El Paso, Tex.....	83	32	59.0	.04
North Dakota pump- ing.....	Williston, N. Dak.....	62	- 5	26.0	1.21
Umatilla.....	Hermiston, Oreg.....	75	22	46.5	.16
Klamath.....	Klamath Falls, Oreg.....	68	22	41.8	1.15
Belle Fourche.....	Orman, S. Dak.....	71	8	38.0	.32
Strawberry Valley.....	Provo, Utah.....	75	21	44.4	2.75
Okanogan.....	Omak, Wash.....	66	18	42.6	1.01
Yakima.....					
Sunnyside.....	Sunnyside, Wash.....	73	23	46.4	.07
Tieton.....	Cowiche, Wash.....	66	24	43.0	.71
Riverton.....	Diversion Dam, Wyo.....	69	8	38.4	.02
Shoshone.....	Powell, Wyo.....	70	0	33.0	T.
Indian projects:					
Blackfeet.....	Browning, Mont.....	52	-29	23.5	1.00
Flathead.....	St. Ignatius, Mont.....	65	- 1	33.0	1.46
Fort Peck.....	Popular, Mont.....	62	- 8	29.4	.68

NORTH PLATTE PROJECT, NEBRASKA-WYOMING.

March weather was favorable for farming operations as well as for construction and operation and maintenance work. High winds were somewhat prevalent, and there was no precipitation.

Operation.—The discharge of 100 second-feet from the Pathfinder Reservoir for the City of Casper was maintained until 8 a. m. April 1, when the valve was closed. The Fort Laramie Canal was operated as far as mile 25.5 to furnish water for the Lingle Power Plant.

Maintenance.—On the Interstate Division good progress was made on the usual spring maintenance work, help being plentiful and the weather favorable. The system will be ready for operation by the middle of April.

Crops.—There was little change in the crop situation, with quite a large amount of last year's crop

still unsold. Good progress was made on the preparation of the ground for the new crops.

Live stock.—It is estimated that approximately 1,000 head of cattle and 10,000 sheep were shipped out and that approximately 3,000 cattle and 20,000 sheep are still being fattened.

Drainage.—The two Monighan drag lines on the Interstate Division were laid up for repairs the entire month. The new P. & H. No. 206 drag line arrived, and was moved to Dutch Flats to begin work on the Dutch Flats outlet drain. Excavating was begun on the 10th with one shift, and another shift was added on the 15th. Good progress was made, the total excavation for the working period being 11,084 cubic yards, or 284 cubic yards per shift.

Two contracts were let for drainage work, one for a tile trench on Sheep Creek at 14 cents per cubic yard and another for the Dutch Flats outlet channel at 12 cents per cubic yard.

On the Fort Laramie Division electric drag line No. 131313 continued work on the Cherry Creek Drain, operating with two shifts daily and excavating 44,380 cubic yards of Class 1 material, completing 1.42 miles of drain.

Construction.—Storage division: Good progress was made on the construction of the new outlets at the Pathfinder Dam. Two shifts daily were worked on the excavation of the tunnel and the cave for the valve house, and one shift on concreting the plug in the old North Tunnel and placing the sluice gate. During the month 120 cubic yards of Class 3 material were excavated and 45 cubic yards of concrete placed.

Fort Laramie division: Electric drag line No. 131312 continued work on the East Springer Lateral, operating with two shifts daily, excavating 46,400 cubic yards of material and completing 2.76 miles of lateral. Drag line No. 131343 continued work on the Fort Laramie Canal, operating with two shifts daily, excavating 40,004 cubic yards of material and completing 0.78 mile of canal. Drag line No. 131345 continued work on the Fort Laramie Canal, operating with 2 shifts daily in very hard excavation, a total of 32,070 cubic yards being excavated, of which 17,300 cubic yards were Class 2 and 5,500 cubic yards Class 3. Drag line No. 121150 continued work on the excavation for the wasteway at mile 25.5, operating with two shifts daily. During the month 3,766 cubic yards of material were excavated, a portion of which was loaded into wagons for use in grading around the buildings at the Lingle Power Plant.

The powder crew drilled 3,238 linear feet of holes and used 6,100 pounds of T. N. T. in blasting classified material on the Fort Laramie Canal.

Good progress was made by Government forces on the construction of lateral and canal structures, and preparations were made to start work on an enlarged scale. Several contracts were advertised for earthwork and hauling in connection with this construction work and satisfactory bids were received.

Northport division: Electric drag line No. 131344 continued work on the Northport Canal, operating with two shifts daily, excavating 25,459 cubic yards of material, including 8,425 cubic yards of Class 2 and completing 0.86 mile of canal.

A new Bucyrus Class No. 14 gasoline drag line was received, and after being erected was moved to the big cut on the Northport Canal and began excavating on the 23d. Good results were obtained during the working period.

The Indian Creek and West Indian Creek siphons on the Northport Canal were completed and good progress made on the siphon at Station 253.

Fair progress was made by the contractors on lateral excavation. Advertisements were issued for additional lateral work and the construction of fills on the Northport Canal.

Power system.—The Lingle Power Plant was operated continuously, with three shifts daily. In addition to the power used for construction purposes, 1,300 kilowatt hours were delivered to Lingle, Wyo.; 29,000 to Torrington, Wyo.; 8,800 to Morrill, Nebr.; and 31,900 to Mitchell, Nebr.

Surveys.—The field work on the irrigable area surveys for the lands in the Upper Cherry Creek Valley and under the Springer Lateral system was completed, and work started on the preparation of farm-unit plats for opening the land to entry this coming fall.—*H. C. Stetson.*

NEWLANDS PROJECT, NEVADA.

March weather conditions were quite favorable, although somewhat windy.

Irrigation district and drainage assessment confirmation hearings, which were adjourned on February 11, were again resumed on March 7 and continued through March 30, when Judge McFadden, of the district court, instructed the attorneys in the case to file briefs. A decision in this case is expected in about a month.

March 10 to 23 Electrical Engineer J. M. Gaylord was in Reno, Nev., making tests on power canals and power plants, using Truckee River water as evidence for presentation before the court in the Truckee River water-rights adjudication suit. Mr. Gaylord was called to the stand on March 23 in this connection.

On March 17 Consulting Engineer D. C. Henny arrived in Reno, and on the 18th and 19th conferred with the project manager, Engineer Ferd Boustedt, and Electrical Engineer J. M. Gaylord on power matters in connection with the proposed Spanish Springs reservoir.

Construction.—Bids were opened on March 17 for the excavation of Hardy, Thompson, Lattin, and Wiggins Laterals, involving a total of 3,769.3 cubic yards of earthwork. Each lateral represented one schedule, bids ranging from 11 to 17 cents per cubic yard being accepted. All of these laterals were completed by the end of the month.

Government forces constructed the Kennedy Lateral, 570 feet in length; Smith Lateral, 200 feet in length; and E5B Lateral, three-quarters mile (reconstruction).

Twenty-four minor timber structures were placed in the lateral system as construction, in addition to which six similar structures were installed and charged to water users.

Drag line No. 3 excavated and filled a puddle trench and placed a silt blanket along the inside slope of the Truckee Canal at the point of the canal break which occurred on January 2.

Settlement.—One water-right application, covering 34 acres of irrigable land, was accepted during the month.

Water supply and use.—Lahontan Reservoir storage increased to 166,160 acre-feet at the end of March. The surface of Lake Tahoe rose 0.2 foot, to elevation 6225.18, on March 31. The distribution system was operated for irrigation over the project generally throughout the greater part of the month.

Operation and maintenance.—Maintenance work consisted of the following: Cleaning of about 21 miles of laterals in various districts, using teams and scrapers; reconstruction of about 4 miles of Q, P,

and Pb Laterals, using teams; completion of cleaning H Lateral, using Monighan drag line No. 4; drag line No. 5 (new Austin) completed enlargement of Harmon Lateral and moved to Stillwater, where the banks of S2 Lateral were raised about 3.5 feet over a length of 1,000 feet above the head of the new Dalton Lateral.

On March 3 proposals were received and opened for the excavation of the Dalton Lateral, Stillwater District, schedule 1, involving 2,190 cubic yards of excavation, being awarded to C. H. Hancock at 14 cents per cubic yard. Work on this schedule was completed on March 19, 1921. Schedules 2 and 3, involving 2,242.2 cubic yards and 2,023.6 cubic yards, respectively, were awarded to A. Weishaupt at 12 and 13 cents per cubic yard, and work on these schedules was completed on March 18, 1921.

Following completion of work on the H Lateral, all of the three drag lines used on maintenance work except the new Austin machine were laid up pending future work.

A new timber turnout for the Kc Lateral was installed in Truckee Canal and seven other minor structures were placed by the maintenance force. Eighteen minor timber structures were repaired.—*D. S. Stuver.*

CARLSBAD PROJECT, NEW MEXICO.

March weather was warm and pleasant until about the 25th; after that date the weather was cold and windy until the close of the month.

Maintenance work consisted of the continuance of the regular repair work on the system. The work on the relief lateral for the Black River supply ditch was completed to carry about 10 second-feet, but the full completion of this job was not possible on account of the necessity of crossing some land too wet to hold up work stock. This ditch is designed to carry about 20 second-feet. Three headgates, 2 culverts, 1 flume 35 feet long, and 1 lateral about 2,000 feet in length were completed during the month. Spring maintenance work was practically completed, although there are several protective jobs at highway crossings yet to be completed. The Austin drag line completed work on the B Drain and was moved to C Drain, where about 800 feet were completed at the end of the month. The machine did good work, but there were a few minor defects which have to be corrected. Water was turned into the canal for the regular season's run on March 15, and the canal was carrying about 300 second-feet at the end of the month.

There was no drainage construction during the month.

R. F. Walter, assistant chief engineer, visited the project on March 12 and left for El Paso March 16. He was met at Fort Sumner by the project manager and inspected the Alamogordo Reservoir Site about 15 miles north of that place.

The total run-off of the Pecos River amounted to 10,000 acre-feet. The average run-off was 470 acre-feet at the beginning of the month, and the minimum was 350 acre-feet at the close of the month.

Labor was plentiful for all classes of work. There was considerable idle labor, with the tendency of wages downward.

Practically all of the cotton was shipped to the New Orleans market. About 450 bales were sold by the project farmers during the month, prices ranging from 8 to 13½ cents. Cotton reached its low mark for the season in March. The hay market for the most part was inactive; most of the sales reported were

local, the hay to be used for feed on the project. Considerable land was prepared for annual crops, a large percentage of which will probably be planted to Indian corn and the various sorghum head corns, and the rest to cotton. On March 10 the State National Bank, of Carlsbad, closed its doors. It is generally rumored that the bank will resume business at an early date under a new management.—*L. E. Foster.*

RIO GRANDE PROJECT, NEW MEXICO-TEXAS.

March weather was warm, with the exception of the last four days, when a slight frost occurred. The damage to fruit was light and will probably not affect the yield.

The inflow into Elephant Butte Reservoir at San Marcial amounted to 80,000 acre-feet for the month; the outflow from the reservoir was 95,400 acre-feet.

Maintenance consisted of repairs to small structures, removal of weeds, and repairs to breaks caused by gophers.

The Canutillo Lateral and siphon across the river above Montoya were placed in operation. The general crop outlook is very favorable.

A premium of 10 cents per dozen is received by the Mesilla Valley Poultry Association whose members ship only infertile eggs. Francis E. Lester shipped 340 stock hogs to Panhandle, Tex.

The new dragline equipment received, consisting of a 30-B Bucyrus and two small P & H machines, was tested and showed satisfactory adaptability to canal and lateral construction.

Fifty Arizona ash, 50 poplar, and 10 pear trees were planted near the cottages at Elephant Butte, all furnished by the water users.

The extensive canal reconstruction program undertaken during the nonirrigation season was practically terminated by the beginning of the irrigation season during the latter part of February and the accomplishment of this work drew so heavily on the year's allotment that as soon as possible forces were materially reduced and beginning March 1 all excavators were put on a one-shift basis. Structure and lateral work consisted principally in the completion of features on which construction was begun during the winter. This reduction in construction forces, however, did not apply to Elephant Butte construction, and the work on the embankment paving and spillway channel was pushed as rapidly as possible.

Labor was plentiful and weather conditions were ideal for construction, even the usual high winds of early spring being rare.

In the Rincon Valley construction continued on the Garfield Drain.

In the Mesilla Valley three draglines continued drainage construction and two were employed on canal and lateral construction. Construction of a number of sublaterals was completed, as well as the installation of structures on the new Leasburg and West Side Canal work. The Montoya Siphon was completed and the camp removed.

In the El Paso Valley one dragline continued construction of the Fabens Drain. Three draglines, including the new Bucyrus 30-B and P & H, were employed on canal and lateral work. A number of minor structures were installed in canals and laterals. The Jennings Construction and Engineering Co. made fair progress on their contract for the construction of the Tornillo Drain.

Comparison between operation and maintenance estimates and results, Jan. 1 to Mar. 31, 1921.

Project.	Gross cost.				Accruals.				Area that can be irrigated, 1921.
	Estimate for 1921.		Actual cost to Mar. 31.	Amount *over or under.	Estimate for 1921.		Actual returns to Mar. 31.	Amount more or *less than estimate.	
	Total for year.	To Mar. 31.			Total for year.	To Mar. 31.			
Belle Fourche.....	\$120,000	\$15,000	\$10,200	\$4,800	\$148,000	0	0	0	Acres. 82,800
Boise.....	335,000	91,500	86,000	5,500	311,500	0	0	0	165,800
Carlsbad.....	50,000	18,000	17,400	600	52,000	\$2,500	\$4,400	\$1,900	25,000
Grand Valley.....	60,000	15,800	15,000	800	61,400	500	0	*500	38,350
Huntley.....	75,000	15,000	16,300	*1,300	88,600	0	0	0	31,300
Klamath.....	75,000	10,800	4,000	6,800	87,900	0	0	0	52,500
Lower Yellowstone ¹	66,000				65,000				38,700
Milk River.....	90,000	6,100	6,900	*800	56,000	0	0	0	*74,500
Minidoka.....	134,000	27,400	24,600	2,800	134,000	0	0	0	49,000
Newlands.....	118,700	50,000	52,000	*2,000	120,600	1,300	2,500	1,200	69,300
North Dakota Pumping.....	58,600	6,800	7,500	*700	26,800	0	0	0	7,650
North Platte:									
Interstate.....	275,000	54,000	52,000	2,000	342,800	5,000	5,000	0	*129,900
Fort Laramie.....	63,000	8,200	6,500	1,700	24,000	1,800	1,800	0	14,000
Okanogan.....	35,000	6,400	10,000	*3,600	41,700	0	0	0	8,000
Orland.....	35,000	7,000	9,100	*2,100	41,200	0	0	0	20,500
Rio Grande ¹	242,500				249,000				118,000
Shoshone.....	108,600	18,300	20,600	*2,300	128,000	0	0	0	65,800
Strawberry Valley ¹	87,500				60,300				59,100
Sun River:									
Fort Shaw.....	20,000	4,200	3,000	1,200	26,400	0	0	0	12,200
Greenfields.....	25,000	4,000	3,400	600	10,000	0	0	0	25,100
Umatilla.....	53,000				49,300				26,300
Uncompahgre.....	145,000	36,800	48,800	*12,000	152,300	15,000	21,700	6,700	100,000
Yakima:									
Sunnyside.....	135,000	37,600	41,400	*3,800	150,500	0	0	0	110,800
Tieton.....	92,000	20,600	23,700	*3,100	103,200	0	0	0	32,000
Yuma.....	233,000	42,000	47,500	*5,500	300,000	51,000	51,000	0	61,300
Total.....	\$2,731,900	495,500	505,900	*10,400	2,843,500	77,100	86,400	9,300	1,417,900

¹ Report not received from project in time for publication.

² Stored water is furnished through St. Mary Canal for 21,600 acres additional.

³ Includes 17,000 acres for which water is carried in main canal.

⁴ Total estimated net cost is \$2,652,118.

R. F. Walter, assistant chief engineer, inspected the work on the spillway channel and embankment paving at Elephant Butte; W. A. Meyer, examiner of accounts, made his first inspection of clerical work; and J. L. Savage, designing engineer, visited Elephant Butte, making investigation in connection with change in design for the spillway channel.—*L. M. Lawson.*

NORTH DAKOTA PUMPING PROJECT.

March weather continued favorable. There were 7.7 inches of snowfall.

The Missouri River started to break up about the middle of February, but a cold spell froze the ice over again and final break-up began March 29. Ice was flowing out at the close of the month with the river at a low stage and doing no damage.

Repairs on the floating pumping station were nearly completed, the pumping units having been raised, the hull redecked beneath, and the units put in place again.

Three boilers were cleaned with Lagonda tube cleaners and 350 to 550 pounds of scale removed from each boiler, and airtight covering was applied over the brick settings. In the coal mine the special work consisted of raising the roof in a portion of the main haulage way to permit a corresponding raise in the track and the elimination of a heavy grade.

The power plant was operated for the commercial power contract and 72,500 kilowatt hours of energy were delivered to the city switchboard. This represents a falling off of 32,500 kilowatt hours from the same month of last year, which was due, first, to the fact that during the same month a year ago there was an unusual demand for power, and, second, to the present general wave of economy.

Nine hundred and ninety-five tons of coal were mined.—*Wm. S. Arthur.*

UMATILLA PROJECT, OREGON.

March weather conditions were normal except for a light precipitation.

Farming operations.—Shipments of hay continued, a total of 100 cars being marketed. An average price of \$12 per ton was realized.

Labor conditions.—The local supply of labor was adequate; in fact, a number of applications by foreign labor had to be rejected. At the close of the month a large program of construction and maintenance work had been completed and crews were being reduced accordingly.

Operation and maintenance.—The Feed Canal was operated throughout the month, a continuous head of 49 second-feet being diverted, of which from 26 to 30 second-feet and from 25 to 30 second-feet were delivered to the Echo Mills and Cold Springs Reservoir, respectively. On March 31 water was cut out of the canal below spillway No. 1 in order to permit some maintenance work being done before the spring run was commenced. On March 31 the available storage in Cold Springs Reservoir was 49,200 acre-feet. On the East Side Division the operation season opened on March 15, when water was turned into the Maxwell Canal. Water was turned into Canal A on March 28 and into the West Extension Main Canal on March 16. There was practically no demand for water and only small heads were run for priming purposes. On the East Side Division from 2 to 5 small crews were engaged on miscellaneous maintenance to the canals, laterals, and structures. On the West Side Division

from 2 to 3 small crews were engaged on miscellaneous maintenance work.

Construction.—Early in the month the force on Canal A improvements was increased and the placing of concrete lining was resumed on the 5th. Gravel was furnished and delivered by a local contractor. Sand was loaded and hauled by Government forces. Fair progress was made and at the close of the month 4,000 linear feet of canal had been lined, involving the placing of 1,000 cubic yards or 12,000 square yards of concrete. About 3,000 cubic yards of material were excavated in enlarging the canal preparatory to lining. About two days' work of that planned for the spring remain to be accomplished.

East Side supplemental construction.—Three hundred and ninety-seven linear feet of concrete lining was constructed in District No. 25, and 2 farm laterals; 1,178 linear feet of concrete was constructed in District No. 34; and 4 farm structures in District No. 31.

On the West Side Division 1,210 linear feet of 15-inch concrete pipe were laid on lateral 9a and 2 canal structures installed; 415 linear feet of 15-inch concrete pipe were laid on lateral 12b and 1 farm turnout was installed; 250 linear feet of concrete-lined lateral were constructed on lateral 20f, 1 canal structure was installed on lateral 000, and 1 farm turnout on laterals 5b and 31, respectively.

Barry Dribble, project manager on the Minidoka project, Idaho, visited the project on March 12. H. N. Bickel, examiner of accounts, was on the project March 18 to 22 on fiscal inspection. On March 21 and 22 C. A. Lyman, chief of the repayment division, examined the repayment accounting. On March 28 the project manager met Messrs. James Munn and J. L. Savage, of the Denver office, in Pendleton and a trip of inspection was made to the McKay Reservoir and dam site. A. C. Cooley, of the Department of Agriculture, was on the project March 31 and called at the project office.—*Maurice D. Scroggs.*

KLAMATH PROJECT, OREGON-CALIFORNIA.

March weather during the latter part of the month was generally favorable for construction and farming operations. All of the streams tributary to the project continued in moderate flood, and water was being spilled to Tule Lake all month. The diversion canal was operated at maximum capacity.

A crew of about 40 men was employed at Camp C. The excavation and form work for the C-G Canal headgate structure was completed at the end of the month. Preparatory work was also completed for about 400 feet of concrete lining in the C Canal. The concrete in the above structures will be placed early in April. A part of the crew in Camp C was engaged in bending reinforcing steel for the precast flume units and in the construction of forms. The traveler which will be used to place the concrete on all of the precast work was completed. A small crew was engaged in opening a rock quarry for the crusher plant. One survey party was engaged on general work and in giving lines and grades for the flume job and for structures on the C-G Canal.

Office studies were continued on the Clear Lake Reservoir. Studies were also continued on the location of the J Canal and lateral system for the Tule Lake lands. Drawings were prepared for all form work for the structures on the C-G Canal.

Excavator 122235 was engaged up to the 23d in the construction of drainage ditches for the Upper Van Brimmer drainage district. Line No. 2 was con-

structed from station 52+65 to 104 and drain No. 2-D from station 0 to 17. The total length of drains constructed during the month was 6,875 feet and the total excavation 22,257 cubic yards. From the 23d to the end of the month the machine was being repaired and moved to the No. 6 drain.

Bucyrus drag line No. 121478, a model 14-B machine, arrived on the 29th and was erected.

Three small maintenance crews were employed nearly all month in overhauling and repairing timber flumes and minor structures.

Bids for the leasing of Tule Lake lands were opened March 24, and 60 bids were received, ranging from 40 cents to \$6.68 per acre.

The First State and Savings Bank, which closed its doors on January 12, was reopened March 14.—*Herbert D. Newell.*

BELLE FOURCHE PROJECT, SOUTH DAKOTA.

Weather during the first half of March was exceptionally fine and the frost went out of the ground early in the month; it came back, however, for a depth of 4 or 5 inches on the 12th and again on the 21st. Considerable wind was experienced, but no destructive storms, the maximum wind velocity being 54 miles per hour and for a 24-hour period 34 miles per hour.

Labor was plentiful and of much better quality than at the same time last year, although the rate per day was 80 cents less. There does not appear to be much surplus; however, it is probable that when spring work opens up there will be work for everyone.

The Diversion Canal was run continuously throughout the month and was the only canal on the project in operation. The flow in the Belle Fourche River amounted to 21,057 acre-feet and the water diverted through the Inlet Canal was 12,880 acre-feet. The total gain in the reservoir for the month was 12,590 acre-feet. Maintenance crews were at work at various points throughout the project for the greater part of the month. From Orman station the substructure of the Indian Creek Flume was repaired and put in good condition for the season. Four hundred feet of 18-inch vitrified tile pipe drop was placed on the Gillette lateral to give additional capacity below this point; about 60 feet more will complete the job. A dirt work crew was employed on the Johnson lateral whenever frost conditions would permit, and that canal is now practically in shape for the season's use. Two parties were at work cleaning out and repairing concrete culverts under the North and South Canals; all of these structures have begun to give way and it has been found necessary to place new bottoms and new side walls to prevent collapse. The Vale maintenance force was employed in stripping gravel pit and preparing the canal for lining for about 400 feet just below the Belle Fourche Tunnel, on account of danger from slipping, it being found necessary to line the lower bank and half of the bottom with concrete. A cut-off wall 2½ feet in depth was placed in the center of the canal to prevent water from getting through the porous shale, and the reinforcing was made ready for the concrete whenever weather becomes favorable for pouring. From 8 to 12 men were employed, working out from Newell the greater part of the month. The work done by this party was the placing of concrete around the 18-inch tile siphon across the experimental farm for a distance of 145 feet, the excavation of 600 cubic yards of covering over the Lang siphon, where it has been found necessary to put on new bands, the excavation of 60 linear feet of the Deer Creek siphon, and the placing of

new staves where the original material placed in 1914 was badly decayed, the moving of one portable house to Government reserve for ditch rider's headquarters, and minor repairs to 24 drops, 25 head gates, 10 checks, and 2 weirs. At the close of the month the frost was all out of the ground and ditches were drying rapidly. It is planned now to start cleaning of laterals in the Newell district within the first week of April.

Bids were opened under proposals 393 for earthwork, Willow Creek lateral extension. Five bids were received, the range for class 1 material being from 23 to 30 cents. The lowest bidder was Threet Bros., of Lovell, Wyo., whose bid was 23 cents per cubic yard. The low bidder, if awarded the contract, contemplates beginning work in April.

T. R. Smith, assistant engineer, transferred from the Strawberry Valley project, arrived at Newell on the 27th and began work in the Willow Creek district on the 30th.

The P. & H. drag line will be started to work as soon as an operator can be secured. This machine will be used first in cleaning the drainage outlet of the old lake bed near the station at Newell and will then be moved to the site of the Willow Creek siphon and employed in digging the trench for the pipe.

Project stock was in good condition. Most of the sheep men reported 100 per cent or better yield on their lamb crop. The outlook for range for this spring is poor unless heavy rains occur soon to start the grass and to fill the water holes. The total precipitation for the year to date amounts to only 0.8 inch.

Owing to the unusually open and warm weather during March, farmers planted a large percentage of their small grains and are well along with spring work. Probably 60 per cent of the small-grain fields have been planted. There was no demand for alfalfa hay, although a large portion of the crop was still on the project. Some sales were made recently in the Vale district at \$1 per ton in the stack and other sales were reported at \$2. Some stacks of inferior grade were burned to get them out of the way.—*B. E. Hayden.*

STRAWBERRY VALLEY PROJECT, UTAH.

March weather was mild, with intermittent storms.

Farming operations.—Spring plowing continued throughout the month, and land was prepared for sowing. Winter-wheat crop was in excellent condition. An early spring is anticipated.

Labor conditions.—No scarcity existed in any class of labor and many requests were received for employment.

Operation and maintenance of storage works.—Work on repairs to Strawberry Tunnel continued. Between stations 96 and 120, 170 linear feet of reinforced concrete floor and 71 concrete bays were put in. The crushing plant handled 178 cubic yards of material and the mixing plant 120 cubic yards of concrete.

Health conditions at West Portal Camp continued good. Transportation on Diamond Fork Road was difficult because of the spring thaw.

Hydroelectric power plant operations.—The power plant was operated without interruption and power furnished to the towns of Spanish Fork, Payson, Springville, and Salem. Repairs to exciter turbine units progressed satisfactorily.

Telephone and transmission lines rendered good service.

General.—Plans for installation of radial at waste-way of power plant were received. Eighty-five per cent of the 1920 water-right charges had been paid at the end of the month.

Visitors.—W. A. Meyer, examiner of accounts, March 9 to 15, and J. R. Alexander, district counsel, March 29 to 31.—W. L. Whitmore.

OKANOGAN PROJECT, WASHINGTON.

March weather was generally mild with snow melting slowly and all of the water going into the ground.

Two and part of the time three men were employed on repairs to the Salmon Lake engine and the erection of the Duck Lake engine. Two men were employed hauling gravel and erecting the forms for the replacement of minor structures. The project office force was busy in carrying on routine work, writing and assembling the project history, and other work made necessary by the beginning of the operation and maintenance work. The inflow into the Conconully Reservoir amounted to 307 acre-feet, which is below the normal for the month of March.

A stronger apple market caused all of the remaining apples to be packed and shipped. The price of hay remained the same with no local hay for sale. The project was visited by H. N. Bickel, examiner of accounts, from the 2d to the 7th, and by C. A. Lyman

from the Washington office, from the 14th to the 16th.—*Calvin Casteel.*

YAKIMA PROJECT, WASHINGTON.

The prevailing temperature was slightly above normal, with more than average precipitation. Depth of snow on the ground at the reservoirs at the close of the month was as follows: Keechelus, 43 inches; Kachess, 11 inches; Cle Elum, 0; Bumping Lake, 34 inches.

Operation and maintenance, Sunnyside division.—Spring maintenance work was completed, consisting of removal of silt from the canals and weeds and brush from canal right of way, gravel riprapping of canal banks, and repairs to drop basins and Mabton spillway. Priming of Sunnyside Main Canal was started March 21, and by the end of the month all canals and main laterals were primed, except the Mabton lateral. About 500 second-feet were running in the canal at the end of the month. Supervision and assistance were furnished the several pumping districts in the annual overhauling and repair of the pumping machinery, this work being practically completed at the end of the month, the machines in operation, and discharge pipes filled.

Tieton division.—The diversion of 15 and 12 second-feet, respectively, from the North and South Forks of

Crop report, Strawberry Valley project, Utah, 1920.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	8,470	Ton.....	26,002	3.1	\$16.00	\$416,032	\$49
Alfalfa seed.....	9	Bushel....	54	6.0	15.00	810	90
Apples.....	68	do.....	5,950	87.5	1.25	7,440	102
Barley.....	353	do.....	15,138	42.9	.90	13,624	39
Beans.....	11	do.....	69	6.3	5.00	345	31
Beets (sugar).....	6,263	Ton.....	73,480	11.7	12.00	881,800	141
Cane.....	14	do.....	151	10.8	15.00	2,265	162
Cherries.....	36	Pound....	28,760	799	.075	2,157	60
Clover hay.....	118	Ton.....	133	1.1	14.00	1,862	16
Clover seed.....	70	Bushel....	535	7.6	15.00	8,025	115
Corn fodder.....	375	Ton.....	1,950	5.2	6.00	11,700	31
Corn seed.....	115	Bushel....	2,953	25.7	.90	2,658	23
Ensilage.....	77	do.....	812	10.5	10.00	8,120	105
Fruits, small.....	34	do.....			.14	6,822	201
Garden.....	332	do.....				17,732	53
Hay.....	369	Ton.....	432	1.2	14.00	6,048	16
Melons.....	13	do.....				1,650	127
Millet seed.....	3	Bushel....	80	26.7	2.50	200	67
Milo maize.....	5	do.....	100	20.0	.90	90	18
Oats.....	1,462	Bushel....	58,245	39.8	.60	34,947	24
Pasture.....	1,869	do.....				20,570	11
Peaches.....	250	Bushel....	26,321	105.3	2.00	52,642	211
Peas.....	68	Ton.....	68	1.0	35.00	2,380	35
Potatoes, white.....	359	Bushel....	42,366	118.1	.75	31,774	89
Potatoes, sweet.....	2	do.....	190	95.0	2.00	380	190
Rye.....	59	do.....	694	11.8	1.50	1,041	18
Squash.....	2	Ton.....	35	17.5	7.00	245	122
Tomatoes.....	4	Bushel....	391	97.8	1.00	391	98
Wheat.....	8,440	do.....	235,512	27.9	1.75	412,150	49
Total cropped.....	29,250	Total and average.....				1,945,900	66.50
		Areas.		Acres.	Farms.	Per cent of project.	
		Total irrigable area farms reported..		32,981	2,400	100	
		Total irrigated area farms reported..		32,350		98	
		Under water-right applications (private).....		25,022		74	
		Under rental contracts (special).....		8,601		26	
		Total cropped area farms reported..		29,250	2,400	89	
Irrigated, no crop.....	3,100						
Total irrigated.....	32,350						

Cowiche Creek was continued up to the 8th of the month for filling cisterns. Minor repairs were made on the main canal, and spillway machinery repaired and adjusted. Cleaning of rock section below North Fork Tunnel was started at the end of the month. The patrolmen were engaged in cutting willows, making minor repairs to delivery structures, and cleaning weeds and silt from the distribution system. The installation of 1,600 feet of 24-inch reinforced concrete pipe on lateral C-3.15 and the erection of structures in connection therewith, were completed. Replacement of 78 feet of 30-inch reinforced concrete pipe on the D-1 siphon was also completed, and repair of small pipe lines begun.

Storage division.—Repair work on the Bumping Lake telephone line, being done in cooperation with the Forest Service, was completed on the 26th. The reservoir gates at Kachess and Keechelus were operated so as to maintain storage practically equal to that of last year. Cool weather toward the close of the month left these reservoirs approximately 1.5 feet below the level of last year at this time. The Bumping Lake gates were opened and the reservoir was practically empty at the end of the month.

New divisions.—Work was continued on plans and estimates for the Roza and Moxee Divisions with funds advanced by the respective irrigation districts under contract.

Miscellaneous.—F. T. Crowe arrived on March 23 to take charge of construction work on the Tieton Dam, funds having been provided therefor in appropriations for the fiscal year 1922. Project Manager J. L. Lytel returned from Washington on March 25, where he was in attendance at a conference between Indian Service and Reclamation Service officials, relative to permanent storage water rights for Yakima Indian Reservation (Wapato Division), a memorandum agreement being drawn up which received the approval of the Secretary of the Interior on April 11. Chief Engineer F. E. Weymouth, Consulting Engineer D. C. Henny, Engineers James Munn and J. L. Savage, of the Denver office, attended a board meeting at Tieton Dam on March 31 and April 1. Other members of the board were J. L. Lytel, C. E. Crownover, and F. T. Crowe.—*J. L. Lytel.*

RIVERTON PROJECT, WYOMING.

March weather conditions were favorable for construction and the roads were in excellent condition for hauling throughout the month. The temperature was several degrees above normal. There was practically no precipitation.

Drag lines Nos. 121322 and 121323 were operated two shifts each throughout the month. These machines excavated from the Wyoming Canal a total of 38,828 cubic yards, of which 3,200 cubic yards were excavated from outside the canal prism. Of the total material moved, 8,152 cubic yards were class 1, heavy gravel and cobblestones; 20,019 cubic yards were class 2, a hard, sandy shale; and 10,657 cubic yards were sandstone requiring blasting. Two shifts were employed throughout the month drilling and blasting sandstone.

Drag line No. 121322 completed the excavation to grade of the canal along the sidehill east of the deep draw at about station 235. On the 28th and 29th it moved around this draw, taking three shifts for the move, and continued west, excavating the canal to grade. Nearly all the material moved by this machine was shale. Drag line No. 121323 was excavating to grade throughout the month, and most of the material moved was sandstone.

Drag line 121474 was received from the Bucyrus Co. on March 23 and was being unloaded and erected at the end of the month. This machine will be at once moved to the canal, and it is hoped that excavation can be begun during May.—*H. D. Comstock.*

SHOSHONE PROJECT, WYOMING.

March was a rather disagreeable, windy month. The mean temperature was slightly below the average. There was very little precipitation. The weather was favorable, however, for practically all kinds of outdoor work, the main exception being drainage excavation in wet soils, where there was 18 to 24 inches of frost.

Water supply.—The Shoshone Reservoir dropped steadily throughout the month, as one of the 42-inch blow-off pipes through the base of the dam was open.

Operation and maintenance.—Maintenance work was carried on with large crews throughout the month. The principal single item of work was repairing 5 concrete drops in the Garland Canal with the cement gun and also placing paving below these structures. Other maintenance work consisted principally of placing brush and rock riprap and of burning weeds in the distributaries. Owing to the fact that there had been practically no precipitation since last June the ground was very dry and it will be necessary to irrigate before seeding. With some of the heavier soils it will be necessary to irrigate before spring plowing. As a result water was turned into the canal system on March 27, and the first delivery was made on March 30. The irrigation season this year is about 20 days earlier than any former season.

Crops.—Farmers took advantage of the unusually mild season and prepared their land for this year's crops. The following shipments were made from the project during the month: Alfalfa hay, 69 cars; alfalfa meal, 53; wheat, 2; potatoes, 2; sheep, 3; hogs, 2; cattle, 1 car.

Labor.—The labor situation was satisfactory.

Drainage.—The first drainage excavation this season began on the 9th, when Bucyrus drag line No. 121324 renewed excavation on open drain 28 and 3,020 linear feet were excavated. The Monighan drag line started work on open drain Z on the 17th, but was forced to stop by frost on the 19th. The Austin trencher completed closed drain C-1, beginning the 17th and finishing the 22d, and then moved to closed drain H of the West Garland area, beginning work there the 26th. It completed 2,630 linear feet of drain during the month. A new P. & H. No. 121161 drag line was received and set up during the month and was used in structure excavations and backfill on open drain 28. A new class 14 Bucyrus drag line was received on the 19th. It was unloaded and erected and began moving to its work on open drain 27 on the 30th of the month. The new P. & H. drag line 121153, unloaded at Cowley last winter, was moved to the work on Sage Creek Channel rectification near Cowley Station. The Bucyrus drag line 11128 began the excavation of open drain 102 west of Deaver on the 31st.

Field and office engineering.—Field work was carried on by two crews on the Frannie Division and one crew on the Garland Division. One crew worked on the Frannie Division construction and the other on drainage investigations. The crew on the Garland Division was engaged on work for drainage construction and investigations and a small supplemental sur-

vey. Office work consisted of the preparation of the 1920 project history, drainage investigation studies, preparation of drawings for the power plant, and work on supplemental survey notes.

Construction.—Construction work was continued on the Frannie Division the entire month, mostly on concrete structures on the third part, the construction of a portion of the waste water recapture system for the first part, and the wasteway at the end of lateral D-23 for the second part. At Shoshone Dam the excavation of the powerhouse site was continued. The excavation on the by-pass was started, good progress was made on the driving of the power tunnel, and 240 linear feet of tunnel were driven during the month, operating two shifts. The tunnel excavation was about 50 per cent completed.—*J. S. Longwell.*

INDIAN PROJECTS, MONTANA.

BLACKFEET PROJECT.

March weather was cold and stormy with several heavy falls of snow and occasional high winds. On account of weather conditions, no preparations were made for putting in this season's crops.

One foreman and two ditch riders completed and painted two houses on wagons, sawed and piled lumber for use on Two Medicine and Badger-Fisher structures, and repaired the telephone line between Browning and Piegan. Two cars of telephone poles for the new line to be constructed between Browning and the operation and maintenance camp on the Badger-Fisher Division were received. No other field work was attempted and none of the systems of the project were operated.—*R. M. Snell.*

FLATHEAD PROJECT.

At Dry Fork Dam the placing of 319 cubic yards of riprap and construction of a bridge from the dam to the gate tower completed work on this feature.

At Pablo Feed Canal excavation progressed from station 1345+95 to 1391+00, a distance of 4,505 feet, involving 26,892 cubic yards of material, of which 18,592 were class 1, 8,000 class 2, and 300 class 3.

At Dry Creek Canal clearing and grubbing progressed from station 120+00 to 80+00, a distance of 4,000 feet. Excavation amounted to 4,396 cubic yards, of which 2,000 were class 1, 2,000 class 2, and 396 class 3. This work was done between stations 135+00 and 100+00.

All construction was done by Government forces.

Winter wheat safely passed the critical stage, and there is little doubt of a good crop. Plowing and seeding were in progress.

Live stock was in excellent condition.—*C. J. Moody.*

FORT PECK PROJECT.

March weather was mild, but cloudy and stormy. A heavy snowfall on the 5th postponed the beginning of construction work.

During favorable weather construction material and supplies were hauled from the Big Muddy Division to Poplar River Camp, preparatory to beginning construction on the Poplar River siphons. Circles for forms were sawed for the siphon on the West Side Canal. The dragline operator arrived on the 16th, and was employed assembling the machine and moving to work.

C. R. Trowbridge, inspector from the Secretary of the Interior's office, visited the project office from March 23 to April 1, inclusive.

The Farm Bureau held a meeting at Poplar from March 2 to 4.

At the end of the month the snow had gone sufficiently for the farmers to begin work.—*R. M. Conner.*

GENERAL OFFICES.

Washington office.—Director Davis was in charge of the office during the month of March, except for a few days when he was in New York for a conference with the Idaho Power Co. in connection with power development at American Falls, Idaho, and on matters connected with the American Society of Civil Engineers.

During the absence of the director the office was in charge of Assistant Director Morris Bien as acting director.

The chief counsel was in the office during the entire month.

Project Manager Lytel and District Counsel Holgate returned to their headquarters on March 18.

During March letters were sent to the Secretary for approval as follows:

March 1, recommending approval as to form of contract providing for the construction by the United States of the Black Canyon Division of the Boise project, and the sale to the Emmett Irrigation District of the right to use the irrigation works with payment by the district in 20 years of the full cost, credits to be given the district for one-half the cost of the dam when payment to that extent shall have been made by the lands of the Black Canyon Division; approved March 2.

March 3, recommending approval of the form of public notice announcing operation and maintenance charges for land under public notice, water rental charges for land not under public notice, charges for permanent storage in Pathfinder Reservoir, and charges for temporary use of excess water on the North Platte project for the season of 1921.

March 3, recommending approval of form of public notice announcing the operation and maintenance charges on the Okanogan project for 1921; approved March 3.

March 3, recommending approval of extension of time to December 31, 1921, for accepting bids for unsold farm units in the First Mesa Unit, Yuma Auxiliary project; approved March 10.

March 5, recommending that payment of construction and operation and maintenance charges of delinquent water users on the Huntley project necessary to secure water for the growing of crops in 1921 be deferred to December 1, 1921, with the usual penalties; approved March 8.

March 5, recommending that authority be granted to approve contract providing for the construction of an irrigation canal on and across the right of way and under tracks of Chicago, Burlington & Quincy Railway Co. on the North Platte project; approved March 23.

March 8, recommending that authority be granted to execute a supplemental contract with the city of Los Angeles providing that the city advance to the Reclamation Service the additional sum of \$12,500 to complete an investigation to determine the availability of water for storage and irrigation purposes in Owens Valley, Calif.; approved March 8.

March 9, recommending approval of terms of agreement relative to furnishing increased storage water to the Yakima Indian Reservation; approved April 1.

March 10, recommending approval of draft of contract with the Gering Irrigation District, North Platte project, to construct a drain at a cost of \$87,000, to be repaid in 10 annual installments.

March 10, recommending approval of draft of contract with the Boise-Mora Irrigation District and the Hillcrest Irrigation District, contiguous to the Boise project, providing that these lands be added to the Boise project, that storage water be sold to them from Arrowrock reservoir, and that the necessary pumping plant or plants and canal system be constructed subject to confirmation by a court of competent jurisdiction, and also to our right to sell the storage water, payment to be made by the district of \$1,458,600 in 10 or 20 annual instalments; approved April 4.

March 11, requesting authority to approve contract with the Idaho Power Co. for supplying power to the Boise and Minidoka projects; approved April 1.

March 16, recommending that steps be taken toward the reconstruction by the Reclamation Service of the works of the Orchard Mesa, adjacent to the Grand Valley project, provided certain conditions are fulfilled; approved March 19.

March 16, recommending the allotment of \$100,000 for the investigation of secondary projects; approved March 19.

March 21, recommending the approval of water charges on the Milk River project; approved March 26.

March 22, recommending that authority be granted to enter into a contract with the State of Wyoming, providing for the expenditure of \$5,000 each by the United States and the State, for a cooperative investigation to determine the feasibility of irrigating a large area on the North Platte River north of Casper, Wyo., and an additional area below the Pathfinder Dam, North Platte project; approved March 30.

Reclamation fund transactions.

[Taken from the Washington office books for the month of [March, 1921.]]

Balance of funds (reported Feb. 28, 1921)---	\$1,120,000.00
Sales of public lands (net)-----	80,813.66
Deposits by special fiscal agents-----	825,521.41
Auditor's collections-----	42,789.29
Total credits-----	2,069,124.36
Withdrawals:	
Advances to special fiscal agents-----	760,000.00
Auditor's settlement-----	23,193.57
Total withdrawals-----	783,193.57
Balance-----	1,285,930.79
Balances with fiscal agents-----	527,541.35
February land sales available in April-----	179,435.32
Estimated March land sales available May 1-----	527,541.35
Proceeds oil-leasing act available April-----	125,000.00
Total estimated funds-----	2,370,900.00

Status of funds in treasury, April 13, 1921.

Reclamation fund-----	\$100,300
Yuma Auxiliary fund-----	237,200
Blackfeet Indian appropriation, fiscal year:	
1919-----	3,240
1920-----	5,779
1921-----	7,367
Flathead Indian appropriation-----	165,860
Fort Peck Indian appropriation, fiscal year:	
1919-----	36,798
1920-----	2,135
1921-----	2,120
Wind River Indian appropriation, fiscal year:	
1919-----	344
1920-----	190

During the month 1,432 inquiries from ex-service men inquiring about the opportunities on the land were answered, making the total of such inquiries received up to the end of the month 182,600.

Among the visitors to the Washington office during the month were George G. Brimmer, Rawlins, Wyo.; Arnold Kruckman, secretary of the League of the Southwest; D. W. Aupperle and Mayor Charrington, of Grand Junction, Colo.; J. T. Whistler, E. J. Mehren, editor Engineering News-Record; E. T. Blaine, of Seattle; former Gov. Spry, of Utah, recently appointed Commissioner of the General Land Office; A. C. Greene, of San Francisco, attorney for some of the Lake Tahoe landowners; N. J. Falkenburg and W. Vredenburg, of Seattle; E. T. Benson, of the Northern Pacific Railway Co.; Gov. Davis and Reclamation Commissioner Swendsen, of Idaho; Messrs. Turner and Adams, of the Columbian Basin Survey, Washington; and Secretary Reyburn, of the Salt Lake Chamber of Commerce.

Denver office.—The chief engineer returned from Washington, D. C., on March 3. He left for Salt Lake City on March 21, where he had a conference with officials of the Oregon Short Line and Project Manager Dibble and Engineer Banks regarding proposed change of railroad location at American Falls, and returned on March 24. He left for Yakima, Wash., on March 27 to consider with a board of engineers construction methods and plans in regard to Tieton Dam. Assistant Chief Engineer R. F. Walter left on March 13 and visited Carlsbad, Rio Grande, and Yuma projects. Assistant Chief Engineer C. P. Williams returned from the Belle Fourche project on March 2. Official visitors included J. R. Alexander, S. O. Harper, D. C. Henny, Walter Ward, H. L. Holgate, and J. L. Lytel. Other visitors included W. M. Bager, chief engineer of the Bucyrus Co.; J. G. Teicher, district secretary of the thirteenth civil-service district, recently established in Denver; Gov. D. W. Davis, of Idaho; W. G. Swendsen, commissioner of reclamation of Idaho; State Engineer F. C. Emerson, of Wyoming; and L. H. Taylor, of Reno, Nev.

In the designing division designs were completed for the highway bridge, Notus Canal, Boise project; detailed designs prepared for minor structures, Belle Fourche project; specifications prepared for drag-line excavator; designs completed for flume and various minor structures, King Hill project; specifications and drawings checked for the construction of Link River Dam, Klamath project; detailed designs for flumes and minor structures, also designs for Connolly Dam, Milk River project; designs were begun for American Falls Dam and Reservoir, Minidoka project; designs were prepared for various culverts and minor structures, North Platte project; specifications for wooden gate lifts were prepared and redesign made for spillway channel, Elephant Butte Dam, Rio Grande project; designs and details were prepared for radial gate, Strawberry Valley project; preliminary designs and estimates were prepared for McKay Creek Dam and appurtenant structures, Umatilla project; preliminary designs and drawings were prepared for Tieton Dam, wasteway, movable crest, and outlet works, with preliminary estimates; designs were completed for structures for First Mesa Unit, Yuma auxiliary project; topographic map of Bulls Head, Black and Boulder Canyon Dam sites were prepared; designs for cableways at Boulder Canyon were made and work continued on the drill progress sheet; map was prepared showing Pecos Valley project; project design for Tally Lake project was revised and work was continued on the standardization drawings for lock joint concrete pipe and forms, cast-iron gates, radial gates, and hoists.

The principal work accomplished in the electrical division consisted of studies relative to the pumping plant, Lower Yellowstone project; drawings of interconnection substation, Minidoka project; estimates of the plant for the Nevada Valleys Power Co., Newlands project; a report of the inspection of the power and pumping systems, North Dakota pumping project; short drawings were approved and inspection ordered for electric and hydraulic equipment for Shoshone dam and specifications prepared for traveling crane; plans were also completed for penstock connections and building foundations, Shoshone project. Studies were made of the increased rates proposed by the Southern Sierras Power Co. and their effect upon the estimated cost of pumping for the Yuma auxiliary project. Investigations and studies were made of the different locations for the proposed power plant at American Falls.

The legal division covered litigation, public notices, irrigation district contracts, opening lands to settlers before the soldiers' preference right expired, and legislation in Colorado and Wyoming. After several conferences with members of the State Legislature of Colorado, and appearance before the subcommittee of the committee on irrigation of the lower house, a law was passed authorizing irrigation districts to take over the assets and assume the liabilities of water

users' associations on any project. A scheme was outlined for elimination of public notices for lands covered by irrigation districts contracting with the United States. Application for taking over the operation and maintenance of the King Hill project was considered with the chief engineer and the project manager of the King Hill project.

An average of 440 pieces of mail per day was received during the month; 1,390 vouchers were handled, involving a total amount of \$414,231.21; advertisements to the number of 501 were issued by the purchasing division, and 660 vouchers prepared involving a net expenditure of \$259,584.06. Transfers between the projects, amounting to \$7,617.14, were effected.

JAMES A. CAMPBELL, 1879-1921.

James A. Campbell, of Hot Springs, Mont., employed as a carpenter at the Lone Pine Camp, Camas Division, Flathead project, was so seriously injured on March 21 by breathing the flames from a gasoline fire that he died the following day. Mr. Campbell was about 42 years old and is survived by a wife and two small children.

Consolidated balance sheet of cash, investment, and capital funds, United States Reclamation Service, Mar. 31, 1921.

	Current month.		Balances.	Subtotals.	Total.
	Debits.	Credits.			
Group 1.—Cash:					
Cash with Treasurer, United States—					
Reclamation fund.....	\$165,930.79		\$1,285,930.79		
Unadjusted.....	20.80		¹ 89.82		
Yuma auxiliary fund.....		\$82.91	278,773.01	\$1,564,613.98	
Cash with special fiscal agents—					
Reclamation fund.....	1,475,851.07	1,582,613.78	527,541.35		
Yuma auxiliary fund.....	91,464.40	62,437.44	52,237.72	579,779.07	
					\$2,144,393.05
Group 2.—Investment (all funds):					
Disbursement vouchers.....	885,404.50		160,185,982.49		
Transfer vouchers received.....	66,497.97		8,330,064.28	168,516,046.77	
Less—					
Collection vouchers.....		840,756.49	36,510,779.47		
Transfer vouchers issued.....		66,497.97	8,330,064.28	44,840,843.75	
Project net investment ²					123,675,203.02
					125,819,506.07
Group 3.—Capital funds:					
Sales of public lands.....		180,813.66	101,931,415.99		
Sales of town-site lots.....			535,954.07	102,467,370.06	
Potassium rentals and royalties.....			10,416.54	10,416.54	
Proceeds under oil leasing act—					
Past production.....			889,048.97		
Current production.....			370.65	889,419.62	
Bond loan.....			20,000,000.00		
Less repayments.....	100,000.00		¹ 700,000.00	19,300,000.00	
Rio Grande Dam appropriation.....			1,000,000.00	1,000,000.00	
Net increase compensation fund.....	651.73	52,619.01	1,663,295.81	1,663,295.81	
Judgments, Court of Claims, deficiency.....			444,968.65	444,968.65	
Yuma auxiliary land sales.....			44,125.39	44,125.39	
	2,785,821.26	2,785,821.26			125,819,596.07

¹ Credit.

² Analysis of project net investment:

Net investment in reclamation fund projects.....	\$123,962,088.36
Collections, Yuma auxiliary project fund.....	\$400,998.66
Less: Disbursements, Yuma auxiliary project.....	114,113.32

Net credit investment Yuma auxiliary project.....	286,885.34
	123,675,203.02

ADMINISTRATIVE ORGANIZATION.

DEPARTMENT OF THE INTERIOR.

HON. ALBERT B. FALL, Secretary of the Interior.
 EDWARD C. FINNEY, First assistant Secretary.
 FRANCIS M. GOODWIN, Assistant Secretary.
 CHARLES D. MAHAFFIE, Solicitor for the Interior Department.
 CHARLES V. SAFFORD, Administrative Assistant to the Secretary.
 CHARLES W. NESTLER, Administrative Assistant to the Secretary.
 HARRY G. CLUNN, Private Secretary to the Secretary.
 JOHN HARVEY, Chief Clerk and Superintendent of Buildings.

U. S. RECLAMATION SERVICE.

WASHINGTON, D. C.

Arthur Powell Davis, director; Morris Blen, assistant director; Ottamar Hamele, chief counsel; J. B. Beadle, director's assistant; C. J. Blanchard, statistician; Hugh A. Brown, editor and office assistant; C. A. Bissell, engineer; A. H. Guillekson, chief accountant; Miss H. A. Fellows and Raymond C. Depue, fiscal agents; C. H. Fitch, chief clerk; Emmet Carr, purchasing agent; G. W. Numbers, appointment clerk; H. N. Bickel, Yakima, Wash.; W. A. Meyer, Denver, Colo., and W. F. Kubach, Great Falls, Mont., examiners of accounts.

DENVER, COLO.

F. E. Weymouth, chief engineer, Tramway Building, Denver, Colo.; R. F. Walter and C. P. Williams, assistant chief engineers; Miss L. H. Meisel, secretary to the chief engineer; J. M. Gaylord, electrical engineer; J. L. Savage, designing engineer; James Munn, consulting engineer; J. L. Burkholder, drainage engineer; W. L. Drager, office engineer; J. M. Luney, chief clerk; A. McD. Brooks, purchasing agent; Harry Caden, special fiscal agent.

FIELD LEGAL OFFICES.

Boise, Idaho.—B. E. Stoutemyer, district counsel. Projects: Boise, Minidoka, King Hill, and Jackson Lake Enlargement; R. M. Patrick, district counsel located at American Falls, Idaho.

Denver, Colo.—Law section office of chief engineer: E. E. Roddis and Armand Offutt, district counsel; J. J. Buck, assistant district counsel.

El Paso, Tex.—P. W. Dent, district counsel. Projects: Rio Grande, Carlsbad, and Hondo.

Helena, Mont.—W. J. Egleston, district counsel, Helena. Projects: Blackfoot, Flathead, Fort Peck, Huntley, Milk River, St. Mary Storage, Sun River, North Dakota Pumping, Lower Yellowstone, and Shoshone.

Mitchell, Nebr.—J. N. Beardslee, district counsel. Projects: North Platte and Belle Fourche.

Montrose, Colo.—J. R. Alexander, district counsel. Projects: Grand Valley, Uncompahgre Valley, and Strawberry Valley.

Portland, Oreg.—H. L. Holgate and D. G. Tyree, district counsel. Projects: Yakima, Okanogan, Umatilla, and Klamath.

San Francisco, Calif.—Henry A. Cox and A. B. Fullerton, district counsel, 349 Pacific Building. Projects: Salt River, Yuma, Orland, and Newlands.

PROJECT ORGANIZATION.

Belle Fourche Project.—B. E. Hayden, project manager, Newell, S. Dak.; R. C. Walber, chief clerk; August Lewin, fiscal agent.

Boise Project.—J. B. Bond, project manager, Boise, Idaho; E. R. Mills, chief clerk; C. F. Weinkauff, fiscal agent.

Carlsbad Project.—L. E. Foster, project manager, Carlsbad, N. Mex.; V. L. Minter, chief clerk and fiscal agent.

Grand Valley Project.—S. O. Harper, project manager, Grand Junction, Colo.; A. W. Walker, engineer; G. H. Murphy, chief clerk; A. H. Hall, fiscal agent.

Huntley Project.—A. R. McGinness, project manager, Ballantyne, Mont.; G. H. Bolt, chief clerk; Miss M. C. Simek, fiscal agent.

King Hill Project.—Walter Ward, project manager, King Hill, Idaho; T. W. Hause, chief clerk; L. D. Eakin, fiscal agent.

Klamath Project.—H. D. Newell, project manager, Klamath Falls, Oreg.; N. G. Wheeler, chief clerk; G. R. Barnhart, fiscal agent.

Lower Yellowstone Project.—L. H. Mitchell, project manager, Savage, Mont.; C. A. Denman, chief clerk.

Milk River Project.—G. E. Stratton, project manager, Malta, Mont.; E. E. Chabot, chief clerk; G. S. Moore, fiscal agent.

Minidoka Project.—Barry Dibble, project manager, Burley, Idaho; Dana Templin, engineer; E. C. Diehl, chief clerk; Miss A. J. Larson, fiscal agent; F. A. Banks, engineer, American Falls, Idaho.

Newlands Project.—J. F. Richardson, project manager, Fallon, Nev.; G. B. Snow, chief clerk and fiscal agent.

North Dakota Pumping Project.—W. S. Arthur, project manager and chief clerk, Williston, N. Dak.; H. C. Melaas, fiscal agent.

North Platte Project.—Andrew Weiss, project manager, Mitchell, Nebr.; H. W. Bashore, engineer, Fort Laramie Unit; Paul Rothl, irrigation manager; J. R. Ummel, chief clerk; Miss A. L. Perrine, fiscal agent.

Okanogan Project.—Calvin Casteel, project manager, Okanogan, Wash.; W. D. Funk, chief clerk and fiscal agent; H. J. Gault, engineer, Conconully, Wash.

Orland Project.—A. N. Burch, project manager, Orland, Calif.; E. T. Eriksen, engineer; C. H. Lillingston, chief clerk and fiscal agent.

Rio Grande Project.—L. M. Lawson, project manager, El Paso, Tex.; T. W. Parry, irrigation manager; C. A. Peavey, chief clerk; L. S. Kennicott, fiscal agent.

Riverton Project.—H. D. Comstock, project manager, Riverton, Wyo.; R. M. Conner, engineer; G. H. Baird, chief clerk; J. C. Thrailkill, fiscal agent.

St. Mary Storage Unit.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk; H. E. Bruce, fiscal agent.

Salt River Project.—Being operated by the Salt River Valley Water Users' Association; C. C. Cragin, general superintendent and chief engineer, Phoenix, Ariz.

Shoshone Project.—J. S. Longwell, project manager, Powell, Wyo.; J. R. Iakisch, engineer; C. M. Jump, superintendent of irrigation; W. F. Sha, chief clerk; L. H. Kilne, fiscal agent.

Strawberry Valley Project.—W. L. Whittemore, acting project manager, Provo, Utah; J. E. Overlade, chief clerk and fiscal agent.

Sun River Project.—G. O. Sanford, project manager, Great Falls, Mont.; H. W. Johnson, chief clerk; Miss M. G. Valentine, fiscal agent; G. A. Benjamin, irrigation manager, Fairfield, Mont.

Umatilla Project.—H. M. Schilling, project manager, Hermiston, Oreg.; M. D. Scroggs, superintendent of irrigation; G. C. Patterson, chief clerk and fiscal agent.

Uncompahgre Project.—L. J. Foster, project manager, Montrose, Colo.; A. H. Peach, chief clerk and fiscal agent.

Yakima Project.—J. L. Lytel, project manager, Yakima, Wash.; C. E. Crownover and C. F. Gleason, engineers; R. K. Cunningham, chief clerk; J. C. Gawler, fiscal agent; J. G. Heinz, engineer, Sunnyside, Wash.; J. S. Moore, superintendent of irrigation, Naches, Wash.; F. T. Crowe, engineer in charge construction Tieton Dam, Rimrock, Wash.

Yuma Project.—P. J. Preston, project manager, Yuma, Ariz.; R. M. Priest, superintendent of construction; E. R. Schepplmann, chief clerk; E. M. Philebaum, fiscal agent.

INDIAN PROJECTS.

Blackfoot Project.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk and fiscal agent.

Flathead Project.—C. J. Moody, acting project manager, St. Ignatius, Mont.; J. M. Swan, chief clerk; J. P. Siebeneicher, fiscal agent.

Fort Peck Project.—S. A. Kerr, project manager, Poplar, Mont.; Henry Berryhill, chief clerk and fiscal agent.

WORK AND SAVE. BUY GOVERNMENT SECURITIES.



EMPLOYEES, YAKIMA OFFICE, YAKIMA PROJECT, WASH.

Left to right, upper row: C. F. Gleason, engineer; J. L. Lytel, project manager; R. S. Calland, assistant engineer; R. K. Cunningham, chief clerk; Sam Burrows, recorder of surveys; J. V. Mineah, instrument man; R. B. Van Horn, instrument man; C. J. Clement, instrument man. Second row: P. M. Wheeler, bookkeeper; Ed. Gibson, rodman; J. S. C. Gawler, fiscal agent; Claude Gallup, rodman; A. B. Hart, chief of field party; R. E. Morton, clerk; C. E. Crowder, engineer; R. E. Bate, chairman; J. N. Chitwood, instrument man. Lower row: Mrs. A. L. Birum, telephone operator; Amie L. Mook, junior clerk; Maybra E. Tyler, junior clerk; Debbie Stemple, clerk.

The Reclamation Record

ISSUED MONTHLY BY THE RECLAMATION SERVICE
DEPARTMENT OF THE INTERIOR, WASHINGTON, D. C.

Better Farming : Better Business : Better Living

THERE CAN BE NO SUREER INSURANCE FOR THE NATION THAN TO PUT ITS MEN UPON THE SOIL

VOLUME 12, No. 6

PRICE {FREE TO OUR WATER USERS
{SEVENTY-FIVE CENTS A YEAR TO OTHERS

JUNE, 1921



HOME OF H. H. BROOK
NEAR LAS CRUCES, N. M.
PRES. ELEPHANT BUTTE
IRRIGATION DISTRICT



ELEPHANT BUTTE DAM

EMANCIPATION

(Inspired by the Newlands National Irrigation Act, June 17, 1902)

The Nation reaches its hand into the Desert,
And lo! private monopoly in water and in land is scourged
from that holiest of temples,—the place where men
labor and build their homes!

The Nation reaches its hand into the Desert.
The wasting floods stand back, the streams obey their
master, and the stricken forests spring to life again
upon the forsaken mountains!

The Nation reaches its hand into the Desert.
The barred doors of the sleeping empire are flung wide
open to the eager and the willing, that they may
enter in and claim their heritage!

The Nation reaches its hand into the Desert.
That which lay beyond the grasp of the Individual yields
to the hand of Associated Man. Great is the
Achievement,—greater the Prophecy!

From "Conquest of Arid America," in 1905 Edition.

By *Wm. Elmyr*

IRRIGATION HAS HELPED MATERIALLY TO PRODUCE THESE RESULTS.

Carlsbad Project, New Mexico.

By L. E. Foster, Project Manager.

YEAR OF 1920.

Values created.

Values of farm lands and improvements on project estimated by the owners at close of 1919	\$2, 500, 000
Value of live stock	206, 635
Value of farm equipment	123, 440

Total	2, 830, 135
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Assessed valuations.

Farms	\$1, 423, 960
Towns	2, 000, 000
Public utilities	300, 000

Total	3, 723, 960
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Value of crops produced in 1920.

Alfalfa	\$381, 364
Cotton	555, 480
Wheat and oats	16, 552
Corn	4, 192
Miscellaneous	6, 223

Total	963, 811
-------	----------

Value of crops produced since 1909 (actual census)	6, 525, 266
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Shipments of agricultural products, 1920.

Alfalfa	Cars. 615
Alfalfa seed	4
Cattle	266
Wheat	2
Sheep	25
Cotton	142
Cotton seed	53

Total annual shipments	1, 107
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Wholesale purchases of manufactures during 1920.

Dry goods, clothing, shoes	\$367, 600
Lumber	125, 000
Automobiles, trucks, etc.	250, 000
Groceries	402, 000
Hardware and implements	235, 000
Coal, feed, flour, and bags	250, 000
Drugs and sundries and cigars	85, 000
Furniture	126, 500
Other merchandise	55, 000

Total for one year	1, 896, 100
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Other significant statistics, 1920.

Number of farms	370
Number of towns	4
Population	4, 800
Acres supplied with water	24, 991
Acres in crop	22, 172
Public schools	8
Churches	10
Newspapers	2
Troop of cavalry fully equipped	1
Banks	5
Capital stock	\$325, 000
Deposits	\$180, 000
Number of depositors	2, 605
Industries:	
Cotton gins	4
Ice factory	1
Steam laundry	1
Gypsum plaster mill	1
Railroads	20 miles
Hydroelectric power plants supplies	350 horsepower for lighting and power purposes on the project
	2

North Dakota Pumping Project, Williston Division.

By A. R. Barbour, Assistant Engineer.

The North Dakota Pumping Project has the distinction of being the only pumping project operated by the United States whose power is developed by steam. It also has the only coal mine both owned and operated by the United States.

The source of water is the Missouri River, from which the water is pumped by electrically driven pumps on a floating barge.

Prior to 1919 the project was operated on a rental basis. Since 1919 it has been operated by the United States under a contract with the Williston Irrigation District and is gradually becoming an important factor to the community.

Because of the close relation of project lands to outlying lands it is impossible to secure a record of outgoing shipments, as live stock, hay, and other products are all assembled by jobbers without record as to whether from irrigated or nonirrigated lands.

Although the town of Williston was established prior to the construction of the project, its population in the construction year (1906) was 611, compared to 4,124 at the census of 1920.

These figures were collected by the local commercial club and compiled from the records of the Reclamation Service.

YEAR OF 1920.

Values created.

Value of farm lands and improvements on project, estimated by the water users at the close of 1920-----	\$368,000
Value of live stock-----	85,000
Value of farm equipment-----	35,000

Total-----	488,000
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Assessed valuations.

Farms-----	\$207,000
Towns-----	1,870,000
Public utilities-----	449,000

Total-----	2,526,000
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Value of crops produced in 1920.

Alfalfa-----	\$3,920
Other hay-----	35,012
Oats-----	10,624
Potatoes-----	16,470
Wheat-----	15,359
Miscellaneous-----	25,398

Total-----	106,783
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Wholesale purchases of manufactures in 1920.

Dry goods, clothing, shoes, etc-----	\$1,250,000
Lumber-----	75,000
Automobiles, trucks, etc-----	300,000
Groceries-----	200,000
Hardware-----	50,000
Farm implements, etc-----	30,000
Electrical supplies-----	10,000
Coal, feed, flour, and bags-----	10,000
Drugs and sundries-----	100,000
Jewelry and miscellaneous instruments-----	25,000
Cigars, etc-----	70,000
Furniture-----	25,000
Other merchandise-----	40,000

Total (project and vicinity)-----	2,185,000
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Other significant figures.

Number of farms-----	130
Number of towns-----	1
Population-----	4,124
Public schools-----	5
Churches-----	8
Newspapers-----	2
Banks-----	3
Capital stock-----	\$200,000
Industries:	
Coal mines-----	7
Creamery-----	1
Flour mills-----	2
Acres irrigable (Williston Irrigation District)-----	7,653
Acres irrigated, season of 1920-----	2,808
Acre-feet of water pumped, season of 1920-----	4,000
Acre-feet of water delivered to water users, season of 1920-----	2,684
Tons of coal mined for consumption in project power house-----	14,119
Capacity of project power house, horse-power-----	2,080

COMPREHENSIVE NATIONAL RECLAMATION
POLICY URGED.

Senator Phipps, of Colorado, recently presented to the Senate the following memorial of the Legislature of Colorado:

Whereas the future growth and prosperity of Colorado and the entire West and Southwest is of vital importance in connection with the maintenance of our national institutions and of inestimable value in connection with the future defense of the Nation, and is almost wholly dependent upon the development and utilization of natural resources, particularly the reclamation by irrigation and drainage of the vast areas of now unproductive desert and swamp lands; and

Whereas the wisdom of Government reclamation of arid lands by irrigation and drainage has been fully demonstrated through the accomplishments of the United States Reclamation Service, created by an act of Congress in 1902, whereby former arid and wholly unproductive lands now sustain upward of 45,000 prosperous families and contribute annually \$80,000,000 in crop value to our national wealth; and

Whereas there is an urgent necessity for stimulating activity in that greatest of all American industries—home building—and for the lending of national support to the “back-to-the-farm movement,” in order that our discontented floating population might be permanently cemented to the soil and its loyalty as citizens guaranteed to the Nation; and

Whereas the most important of these reclamation enterprises are beyond the scope and probability of development by private or even State capital, but are essentially national problems; Now, therefore,

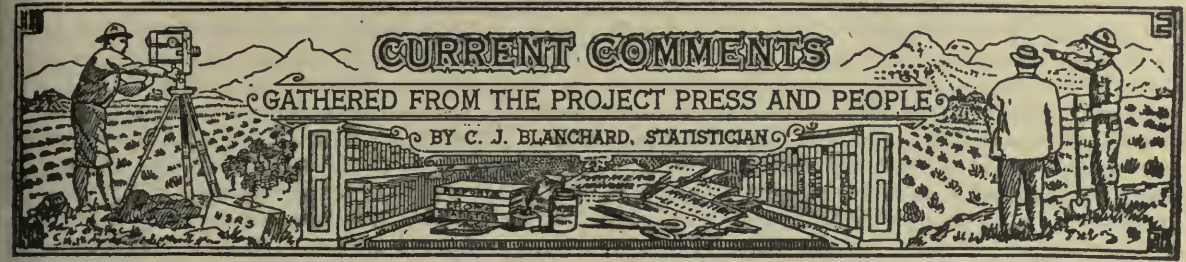
Your memorialists, the Senate and House of Representatives of the State of Colorado, hereby indorse a fixed and comprehensive national policy of reclamation of arid and swamp lands and solicit the immediate enactment of legislation designed and adapted to the needs of this great work, embodying such policies as will make available the natural resources essential to drainage and reclamation.

Senator Walsh, of Montana on the same day presented a resolution of the Legislature of Montana, petitioning Congress “for the immediate passage of liberal legislation providing for the prompt completion of irrigation and reclamation projects now undertaken by the Federal Government, and further providing for the initiation of new irrigation and reclamation projects on a large scale within this State.”

I find in them [the RECLAMATION RECORDS] a vast amount of information, and as we are in the reclamation work ourselves, it makes very interesting reading for me.—P. C. Meredith, President, Idaho Farm Development Co., Buhl, Idaho.

Electric power generated, year of 1920, kilowatt-hour-----	2,100,000
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Pumps water for 8,000 acres; supplies power and light for city of Williston and surrounding coal mines.



CONTINUED depression in the western wool market is responsible for many discussions of the subject by sheepmen and prominent bankers. Consideration of methods for organizing the interests to secure better prices is being given in several States, and much interest is evinced in a suggestion that woolen mills be established in the West. Advocates of this plan point out that every 100 pounds of wool contains 60 pounds of dirt, that freight rates to Boston from Idaho points, for example, are \$3.50 per hundred, and in that State the annual freight bill on wool consigned to eastern markets is \$700,000. It is further cited that the Western States, with abundant and cheap water power, excellent climatic conditions, and cheap food, offer ideal conditions for such an enterprise. Industries of this kind established in the large irrigated districts undoubtedly would contribute materially to the benefit of the sheepmen and to the welfare of these communities and the State.

The importance of the wool business in the West may be gauged by Idaho's statistics. Since 1896, when this State began to take its place among the big producers, Idaho has produced 700,000,000 pounds of wool, which sold for approximately \$112,000,000. During the last 25 years there were shipped out 1,500,000 lambs annually, valued at \$6,000,000, or \$150,000,000 for the period. In addition, the wethers and ewes sold for mutton were worth \$35,000,000, making a grand total of \$300,000,000 cash brought into the State by the sheepmen. It would be nothing less than suicidal to permit an industry of this kind to perish for want of proper consideration and protection.

The recent death of Hon. B. F. Fowler in California is a distinct loss to the West and to the cause of national reclamation, to which he gave many years of his life. In the early days of the movement he became a leader. His large acquaintance in the East, where he had attained prominence in educational work, enabled him to render great service to the irrigation movement by winning to it many of the leaders in Congress. His greatest work came after the passage of the law when he perfected the organization of the water users' association in Salt River Valley and became its president. He lead it through the most trying years of its history, and retired from

this task when it had emerged into one of the most powerful cooperative agricultural organizations in the country.

I think of him now not as a great leader and orator but as the loyal and loving friend with whom I wandered far and wide in the desert places. From his talks beside the camp fires I visualized the wonders of irrigation, which then were only dreams but which to-day are triumphant realities. By his works he shall long be remembered. The great monument to his memory will be neither carven bronze nor sculptured stone; it will forever be a valley redeemed from desolation, a Garden of Allah quickened by floods treasured in the mountains, gladdened by prolific nature, and musical with the laughter of happy children and the songs of contented husbandmen.

The project press during the month of May has lost much of its pessimism and the optimism of the West is once more in evidence. Our farmers generally have set their faces forward and their hands have turned again to the plow. The cultivated acreage of 1921 will be the largest in the history of our projects, and on the majority of them the crop prospects are encouraging. In the valleys, where deciduous fruits constitute an important crop, our reports are gratifying. Frost damage has been slight. A dry spring in Montana and North Dakota made early irrigation necessary, but water in the canals was abundant and ready early. Stock wintered well. Everywhere dairying is growing in popularity. The many farmers' meetings have resulted in cooperative marketing organizations, which are sure to prove beneficial. Labor is plentiful and wages have fallen. With normal prices for live stock and farm products this fall, most of our farmers will be able to get back into their stride and push forward. The tragedy of 1920 will then be only a memory. Let us hope its lessons will not be forgotten.

Circulation of reclamation movies is limited only to our ability to supply the films. We have shown Idaho, Oregon, Arizona, Montana, New Mexico, Texas, and Colorado pictures in Brooklyn, Elizabeth, New Jersey, Indiana, and Baltimore. A six weeks' programme of two reels a week has been arranged with the Ursuline

Academy, of Great Falls, Mont., and we are planning the same for the Uncompahgre Valley towns as soon as these reels are returned.

A number of these reels are being made ready to show through New England in a unique way. A large covered truck containing dynamo and projector will show these pictures in the parks and open places of numerous cities and towns. The truck and equipment are supplied by the Bureau of Commercial Economics of this city.

The exhibitions are entirely free and will attract large audiences. As soon as the weather permits we are going to show reclamation views on the White House lawn, using the truck and the amplifier apparatus so that talking will be made easy. Our pictures taken last summer are being received favorably wherever shown.

Comment is frequently made on the disparity between the sums expended by the States and Federal Government for safeguarding the health of the live stock on farms and that of the children of the country. While millions are annually appropriated for scientific investigations of animal diseases and in promoting better breeds of live stock, only slight attention is given to the subject of the health of the children. Down in Pima County, Ariz., two schools have been conducting an interesting experiment in the supplementary feeding of the students. During the mid-forenoon recess the pupils are served with all the milk they will drink. At the present time 225 pupils are getting this mid-forenoon lunch. The beneficial results are indicated by the fact that during the period the average net gain in weight has been 2.12 pounds for each pupil.

NOTED HERE AND THERE.

Arizona, Salt River project.—Notwithstanding the fact that much of their cotton is yet unsold, the farmers of Salt River Valley quite generally made their payments for water assessments last month. The acreage in long-staple cotton this season will be considerably reduced, and alfalfa seeding is replacing it. Many farmers are returning to dairying. Experiments are being conducted at the experiment farm in Mesa to determine the feed value of whole cotton seed for fattening steers. Alfalfa hay and silage are being used for roughage.

A few days ago a Salt River Valley farmer said: "This drop in egg prices is bad for poultrymen, but we will pull through all right and other things will be equalized. We have our ups and downs, but year in and year out we will do as well with poultry as with anything. I have two or three bales of cotton, but my poultry carried me through, and I am not owing anyone for it. When there is a market I have that much clear."

This was one of the small 20-acre farmers; a man who has made good by persistent effort. He raises some fruit, a little cotton, but most of his revenue is from poultry. His success has not been phenomenal, but by continued effort he has made a living, educated his family, and surrounded himself with the comforts and conveniences that, as Charles Eliot says, "makes up the durable satisfaction of life." Best of all is the fact that the poultry furnishes a steady income, his credit is good, but he seldom has need to ask credit, and if he does he knows that he can pay at a certain date.

Another poultryman of the Salt River Valley was just a few years ago a renter. One year market prices of alfalfa and grain were low, and after selling the crop there was not enough to pay the rent and other expenses. He and his wife held council, and his wife said, "I have saved a little from the egg money, and we have raised a nice bunch of chickens. I think we can sell part of them and with the money from the eggs we can pay up." That was pleasant, but then he began to figure that if poultry could pay debts when crop prices were low, why not make poultry raising a business? He is now one of the most successful poultrymen in the State, independent, with a good home, and no debts to worry about.

Poultry raising is not a small business; it is an industry which may be handled on the farms as a profitable side line by the women and children or made a highly specialized business.

Climate, location, and markets make the Salt River Valley of Arizona extremely favorable for poultry, either as a side line or an exclusive business.

A few years ago the Salt River Valley of Arizona was making more rapid progress in the increase in numbers of dairy cattle than any other section in the United States. This was due primarily to the fact that alfalfa grows luxuriantly for practically the entire 12 months and for a period of about 9 months it produces hay or pasture. Six and seven crops of hay in a season are not unusual, and a yield of 7 to 10 tons may be expected by any good farmer who has his land in the right condition. This and the fact that the mild climate does not require expensive barns and stables and that a crop of winter grain may be grown, to be followed by corn or grain sorghum for silage, are some of the factors that contribute to the happiness, convenience, and prosperity of the wide-awake dairyman.

The one thing that upset his equilibrium was the profits which the cotton grower appeared to be making. There is no place in America where long-staple Egyptian cotton has done as well as it has in the Salt River Valley. This cotton in some instances was sold as high as \$1.25 per pound and yields of 1½ bales have been made. This was believed by many dairymen to be so much more profitable than dairying

that they allowed their cows to go; that is, many of them did. With the general readjustment and upset markets of cotton the cotton farmer is now looking enviously at his neighbor who had the foresight to stick to the dairy business.

The dairyman who begins now has it exceptionally easy. Milking stables and silos are the equipment of many farms, creameries and condensed-milk factories are ready to receive the dairyman's products, and the markets of the world are open.

One mistake the dairymen of former years made was in bringing in dairy cows which were not high grade. This is being safeguarded as far as possible by a number of different interests such as the office of the State Dairy Commissioner, the Phoenix Chamber of Commerce, and the State College of Agriculture, cooperating with bankers, creameries, and others who are interested. The dairyman who has maintained his dairy herd now has a steady income and is not embarrassed by the financial situation.

To the dairyman who is seeking land where he can make a home and can produce something more than a mere living, the Salt River Valley offers more, perhaps, than any other section of the country at the present time. Land values have dropped in keeping with the price of farm products, so that the dairyman begins now on a ground-floor basis, and with good cows plus the opportunity which nature offers in the way of soil and climate and an abundance of water which is supplied by the waters stored in the Roosevelt Irrigation Reservoir, the dairy farmer can build a home in a land of sunshine and great opportunities.

Arizona-California, Yuma project.—The efforts of the Reclamation Service to secure options and listings of the excess lands which under orders of the Secretary of the Interior must be sold before December 1, 1921, have not met with flattering success. Up to this writing only 13 owners, representing 1,300 acres, have responded out of a total acreage of 8,700. We doubt if these owners appreciate just what the Government's offer means to them and we are quite sure they do not realize the serious situation in which they will find themselves if through their neglect and indifference their lands remain unsold on December 1. In the first instance the Government is in a position to direct many land seekers to the valley this summer if options at reasonable prices are secured. In the second, if a forced sale is held sacrifice prices will rule and the result will be a lowering of prices all over the valley. Much of this excess land secured in the early days of the project under what many believe to have been a misinterpretation of the law which deprived bona fide homeseekers of a chance to secure a farm, should have been disposed of long ago. A lot of it has been withheld for selfish reasons and those owners should expect no leniency when the time arrives to force its disposal. For two months some excellent Yuma motion pictures have been in readi-

ness for wide circulation awaiting only the announcement that these owners had given options to the Service so that buyers could be assured stable prices.

We can not urge too strongly the importance of prompt action by the owners of excess or other lands to get their listings in the hands of the project manager. If owners in listing these lands will base their prices upon what they would be willing to pay for the land if they were buyers no fault will be found. Please do not forget that since the cotton boom has been punctured the crop of suckers is very short. Real bargains, however, will attract buyers, and the sale of your excess land will give you money to clean up the mortgage on your farm and put you square again with the world.

California, Orland project.—The Holstein breeders of Glenn County, not to be outdone by the Jersey breeders, have begun a calf club of their own breed, in which 12 boys and girls have taken a pure-bred Holstein calf of high quality which they will take care of and develop as best they can under the directions of the county club leader. Eleven of these 12 calves are heifers, the twelfth is a bull. Two were secured within the county and the remaining 10 have been imported for the club work.

Idaho, Minidoka project.—One of the best evidences of a return to normalcy and good sense is found in the increased interest in dairying on the part of project farmers. Just now, when farm products are moving slowly and at low prices, the farmer who can cash a liberal monthly cream check is worrying little. His hay, which will not bring him cash in town, is paying a nice profit when turned into butter fat. He jingles cash in his jeans, while his neighbor who has no stacks is haunting the banker for a loan. Incidentally he is building up his land with abundant fertilizer and will reap a richer harvest from his fields. At the present price of hay, a carload sells for about \$96, while a carload of dairy products is worth about \$20,000.

A contract has just been approved by the Department of the Interior by which the Minidoka project will secure additional electric power during the coming summer. The effect of the contract amounts to a lease of the power house of the Boise project on the Boise River, and the transmittal of part of the power from there to Milner over the lines of the Idaho Power Co.

The Reclamation Service will build a transmission line from Burley to Milner, and will install a substation for transforming the power received from 44,000 to 30,000 volts. It is expected that about 700 kilowatts will be available to the Minidoka project after the arrangement becomes effective on July 1.

The Boise project reserves the right to purchase the electricity which it needs for use of its drag-line excavators for work on the drainage system on that project.

The Idaho Power Co., under the contract, will be entitled to half of the output of the Boise power house, and will pay half the operating expense and half of the rental. The Idaho Power Co. has had a lease of the Boise power house during the last five years, but this lease has expired.

Directors of the Rupert cheese factory held a meeting recently, and a report from the manager, G. C. Brazeal, compiled and read by Mrs. Frank Graham, showed that the conditions of the factory are very commendable. There are about 85 patrons now of the factory and new ones being added all the time, and with the assistance of each one during the hot weather, by bringing the milk in the right stage, it is expected to produce the best cheese possible. They receive about 4,200 pounds of milk daily and make 11 pounds of cheese from each 100 pounds of milk. So a little over 3,000 pounds of cheese is produced each week, which is shipped to Salt Lake City, Boise, and other places.

Montana, Flathead (Indian) project.—One of the most important land deals in the history of Flathead County was that of the sale of the J. C. Wood fruit farm on the east shore of Flathead Lake recently to the Jennison Bros., of Bozeman, for \$13,000.

In October, 1891, J. C. Wood filed on this farm as a homestead, then a dense wilderness and little indicating its potential powers as fruit-producing land of great merit, but Mr. Wood had great faith in the soil and the climatic and scenic conditions surrounding his new home.

The Wood's orchard produces, besides apples, fine peaches, cherries, and plums. In 1920, 600 crates of plums and prunes were produced in this orchard.

Few enterprises have given so much favorable publicity to Flathead County. Out of a dense forest Mr. Wood cleared and put in orchard approximately 50 acres.

Montana, Milk River project.—The banks of Glendive have made it possible for the club workers to get registered Duroc-Jersey gilts from Sidney. These gilts come from stock shipped in last year by the Richland County Farm Bureau and are of exceptionally good bone and quality, weighing around 250 pounds.

It is hoped that 12 to 15 head can be placed with boys and girls. The payment of these gilts is made comparatively easy by allowing the boy or girl to return two sow pigs a year, which will cancel the purchase price. The gilts returned next year at this time will be given to other club members, thus making an endless chain of pig club.

Nevada, Newlands project.—H. J. Long has a Holstein-Fresian cow that has set a new record, producing 30.08 pounds of butter fat in seven days. The cow is named Gracia Colantha Burke and is 7 years old. This is the first time that a like production by one cow has been officially recognized in the State.

Mr. Long has received a letter from the farm authorities of the State university farm complimenting him on the cow's record.

California's prize milkers are now being brought in large numbers to the succulent alfalfa meadows of the Newlands project. George Wingfield, whose experts are gleaned the best from California's dairies, has expressed his hope to bring 5,000 high-class milch cows to the valley to contribute to the support of the cooperative creamery at Fallon. At the rate he is bringing them in his hope seems to be nearing reality. Already a market has been established for 8,000 pounds of butter fat per week.

New Mexico-Texas, Rio Grande project.—Representative alfalfa growers of El Paso County and Dona Ana County, N. Mex., farm bureaus, and others interested in improving local conditions connected with the storing, financing, and marketing the 75,000 to 100,000 tons of hay produced annually under the Elephant Butte project, met in El Paso to consider a proposed plan of organization. The plan as presented proposes to pool the crop on the basis of grades and for the season, and is patterned after the one now in successful operation in California.

The proposition was unanimously indorsed by those present, and an organization committee was chosen to arrange for meetings of growers at all shipping points in the valley. It is hoped by those in charge of the organization that 75 per cent of the acreage may be signed up for sale through the association, which will be organized by the growers early in May.

The alfalfa crop in Dona Ana and El Paso Counties amounts to over \$1,000,000 every year. The association expects to control most of this output for the purpose of securing a higher and more stable price level. They are now looking for a first-class man to handle the marketing end of the business, and propose to hire a high-grade man even if they have to go as high as \$10,000 a year to get him.

The association will be formed under the Texas law framed by Shapiro, who formed, or whose plans were followed in forming, all the great California associations that have been so successful, some of them having been in existence over a quarter of a century. The New Mexico Bean Growers' Association is patterned after this same plan, and in the three years of its life has brought New Mexico Pinto beans from eighth place in price to first place. This has been done by careful grading, adequate advertising, and successful marketing.

Oregon, Klamath project.—One of the interesting experiments being conducted in the Klamath Falls country of Oregon is the raising of commercial peppermint. The roots are planted in what is classed a low type of soil and with comparatively little care the returns often average \$200 an acre. The oil is extracted at Klamath Falls, and the growers are well satisfied with the results.

Washington, Yakima project.—Noel Buchanan, of the Washington State College, announces the first records of 30 pounds of butter produced by Yakima Valley milk cows, following an official seven days' test of Cascade Piebe, a junior 4-year-old, and Cascade Pietertje, a senior 3-year-old, both of the William Todd & Son's Holstein herds.

Cascade Pietertje produced 30.94 pounds of butter from 646.6 pounds of milk in seven days. She is a senior 3-year-old that in a 365-day test produced 914 pounds of butter from 22,043 pounds of milk. She is a daughter of Korndyke Ormsby Piebe, the famous Todd herd sire. Cascade Piebe, a junior 4-year-old, produced 30.52 pounds of butter from 629.8 pounds of milk in seven days.

Of the 56 class leaders in all seven age classes for Holstein-Fresien breed Washington State ranks second in number, only succeeded by California, with 12; Washington has 11 and New York 7. Carnation Farms were three-time winners; F. S. Stimpson, of Hollywood, Wash., Todd & Sons, Yakima, and Charles Eldridge, of Chimaicum, appear twice as leaders. Cascade Blossom was a Todd Holstein 305-pound class for both butter and milk production of the mature class, with 953.24 pounds of butter from 24,043.7 pounds of milk until the record was recently defeated.

Owing to severe losses occurring among the apiaries in Yakima Valley due to poisoning during the spring spraying operations in the orchards, a large number of stands of bees are being shipped to Puyallup for pasture, where they will remain until after the berries have bloomed. The Puyallup small-fruit growers are extending every encouragement to the movement, because the bees may help greatly in the pollenization of the berries.

The following is an estimate of the fruit crop for Yakima Valley's 1921 crop, the largest ever made to date:

	Cars.
Cherries-----	250
Peaches-----	1, 200
Pears-----	2, 500
Prunes and plums-----	140
Cantaloupes and melons-----	400
Apples-----	12, 500
Total-----	16, 990

Barring frost damage, Yakima is due to produce a record-breaking fruit crop the coming season. H. A. Glen, general agent for the Northern Pacific, ventures the first prediction, placing the total at approximately 17,000, for the figures given do not include an allowance for the strawberry crop or the grape crop, which will carry the total over the 17,000 mark. Such a tonnage will break all records for production in the valley, though those well informed must concede that the estimate is well within the possibilities, considering the acreage of fruit trees now in bearing.

The crop season of 1919 holds the record, with a total of 15,500 cars shipped to market. A comparison between the production that year and the estimated production for 1921 shows that while Mr. Glen is figuring on a record-breaking apple crop none of the other estimates is above the normal, and he has taken into consideration damage to peach and cherry trees that will have to be reckoned with this year.

Wyoming, Shoshone project.—The Powell flat is to be a beehive of industry in the line of sugar-beet growing this summer. L. M. Hammond, local field man for the Great Western Sugar Co., reports that he had signed contracts for the growing of 1,472 acres in the Powell district, which consists of Star, Powell, O'Donnell, Ridge, Eagle, and Hogarty receiving stations. Perhaps about 100 additional acres are yet to be signed, which will make a total of little short of 1,600 acres. This is compared with an acreage of approximately 1,500 acres last season, but it should be understood that last season there were 1,000 acres in the hands of new growers and raw land that was illy prepared for a good tonnage yield, whereas this season the 1,600 acres will be almost entirely in the hands of experienced growers, who are planting the acreage that they can handle and can get into suitable shape. That makes a big difference in the yield, and it is the opinion of Mr. Hammond that the tonnage from the crop of 1921 will greatly exceed anything heretofore produced on the flat.

It was only a few years ago on one of our annual visits to the project we had occasion to remark to a number of farmers that climate and soil there were eminently adapted to the growing of superior spuds. At that time the acreage in potatoes was confined to the gardens and none was produced for market. Every variety under the sun was found, and the planting was without care or thought in selection of seed. The successes of a few who in the next season took some interest in this crop made many converts, and each year thereafter showed an increase in acreage and an improvement in product. The 1921 crop will include 1,500 acres contracted to the potato-starch factory at Cowley. The growers are now fairly well organized, are standardizing and grading their products, and we look for a decided betterment in conditions henceforth.

In 1907 the Shoshone project was about as uninviting and desolate a spot as could be found in all arid America. To-day it contains 45,000 acres in cultivation on nearly 1,000 farms. The crop returns for 1920 were \$1,887,000, or \$46 per acre. The population has grown from nothing in 1907 to 5,000 in 1921. There are 4 towns, 12 public schools, 8 churches, 6 banks, and 2,500 depositors, whose banking accounts total \$770,000. The project telephone exchange now has 600 subscribers. Early this fall 4,500 acres will be opened to settlement, and if there are not more than 10 applicants for each farm we shall be surprised.



June Suggestions for Poultrymen.

By H. O. Numbers, Poultry Expert, Loretto, Pa.

THIS is the month when we should be preparing our cull poultry for the markets. The March and April hatched cockerels will be developed up to 1½ and 2 pounds in the lighter breeds. Leghorns, etc., and the heavier breeds, Wyandotts, Rocks, etc., will be marketable in a few weeks. By experience we find it more profitable to get rid of the culls as soon as possible, as the additional feed required to bring the broilers up to 3 or 4 pounds does not offset the gained weight. Furthermore, the price per pound in autumn is usually less than half the price in June or July. You will also require the extra room and grazing for your pullets to say nothing of the annoyance your cockerels will give your growing pullets.

We deem it advisable to secure markets not over 24 hours distant; that is, counting from the time the produce leaves until it is delivered to the customer. This applies to dressed poultry.

We offer you our method of preparing our product for the market. The birds for killing are placed in a clean, dry pen, with deep sand on the floor. The sand provides grit and also keeps the plumage clean. For 10 days we feed a wet mash of corn meal and white middlings, equal parts, moistened with sour milk or buttermilk. We also supply plenty of green feed. For drink we give buttermilk. The birds get all the feed they will clean up. None is left in the troughs over night. After 10 days we kill the old-fashioned way, by cutting off the head and holding until the fowl is done struggling so as not to sustain any bruises. We scald very lightly, just enough to remove the feathers without tearing the skin. The birds are full drawn, and thoroughly irrigated under a spring water faucet, and placed in a tub with flowing water for 10 hours. The carcasses are then removed, and hung up to dry and drain. All the animal heat has been removed and the flesh has been well plumped. We thoroughly dry the birds with clean towels, and replace the giblets, being sure the gizzard has been well cleaned, and the gall removed from the liver, as particular customers require all giblets when buying a dressed chicken. We also fill the inside of the

carcass with celery tops. You will be surprised at the dainty flavor the celery tops give the fowl. It gives the effect of a celery-fed product. Our carcasses being ready for the shipping package, we wrap each bird separately in parchment paper; this makes a sanitary, germ-proof package. We then place this package in corrugated pasteboard boxes, labeled plainly "Dressed poultry, perishable" and ship by parcel post, over 300 miles. We do not ship our produce in ice; for within 24 hours from the time our goods leave us they are in the hands of our customers. We suggest that if a greater distance than 24 hours travel is necessary to reach a customer, the fowls be shipped alive.

The cold-water cooling method has proved very satisfactory for the reasons that all animal heat is removed, the flavor of the fowl is greatly improved, and the flesh is neatly plumped.

Now is the time to get rid of all your old roosters, just as soon as you are through breeding. They are worth more now than later on. During the summer, if not disposed of, they will interfere with the productiveness of your laying hens.

If you have any drone hens put them on the market now. Stewing chickens are in demand. Later big poultry farms will begin to sell off their "laid out" hens, and that usually brings the prices down. Farm as many chickens this season as you can. Don't reduce your flock, rather increase. Many poultrymen—mostly beginners—are selling out, owing to the low price of eggs. They do not reckon on the low price of feed. Poultry products must come down with everything else; they can not remain at war prices when feed is 50 per cent less. Next year poultry prices will be up owing to lack of production.

Recently the writer had the privilege of going over certain sections of the South, and he marveled at the few poultry farms, when all conditions pointed favorably toward successful poultry farming. He was informed by a representative resident of that community "That it was not considered a dignified occupation to farm chickens." The fact that the poultry business has grown to be a billion-dollar industry needs to be proclaimed throughout the United States. Compare it with the steel industry, stock farming,

grain products, it's a business to be proud of, and only in is infancy.

One last suggestion: If you are not fond of birds, if you dislike animals, if you have no patience, or are unreasonable, do not enter the poultry business, and if you are in, get out; you'll not succeed.

Poison Grasshoppers.

Farmers need no longer be helpless against the ravages of grasshopper hordes in their fields. If discovered in the early days of their attack, these pests are now quite easy of control by means of poisoned baits, the most effective of which is described below. This method has been used with remarkable success in many parts of the United States, its complete effectiveness depending only upon the discovery of the young insects before they have attained any considerable size, when the injury done by them is still very slight, and when they are wingless and easily killed by poisons or mechanical means. Entomologists in the United States Department of Agriculture tell how to make and apply this bait, as follows:

The constituents are wheat bran, 25 pounds; Paris green, 1 pound, or white arsenic, 1 pound; lemons or oranges, 6 finely chopped; low-grade molasses such as refuse from sugar factories, or cattle molasses known as "blackstrap," 2 quarts; water 2 to 4 gallons. The bran and Paris green or other arsenical poisons are thoroughly mixed while dry, the fruits finely chopped and added, and lastly the molasses and water are poured over the bait and the whole thoroughly kneaded. A coarse-flaked bran is most desirable, although where this can not be obtained easily ordinary middlings or alfalfa meal may be substituted; a low-grade, strong-smelling sirup or molasses, however, is essential to the entire success of the poison. Crushed ripe tomatoes, watermelons, or limes may be substituted for the lemons or oranges if necessary. Ordinary powdered white arsenic (arsenious acid) contains nearly twice as much arsenic as Paris green and is comparatively low in price. The powdered form of arsenate of lead may be used, but in this case twice as much of it must be used as of the Paris green. In California and other semiarid regions water should be added to the bait at the rate of at least 4 gallons to 25 pounds of bran, as in these climates the bait dries out very rapidly and the extra moisture is necessary in order to attract the grasshoppers.

The poisoned-bran bait is distributed over the infested fields by sowing broadcast, either on foot or from a light wagon or buggy. In applying the bait in orchards, care must be taken to avoid distributing it close to the trees, because severe injury to fruit trees occasionally results from heavy applications of arsenical poisons.

The time of day chosen for distributing the poisoned baits has an important bearing upon the results

secured. In California and other semiarid regions the bait should be distributed in late afternoon or early evening, just before the grasshoppers ascend the plants on which they usually pass the night. They are apparently hungry and thirsty at this time and greedily take the bait if it be available. In the moister portions of the country, such as New England and Florida, the bait is best applied in the early morning, before sunrise if possible. Farmers should not be discouraged if the grasshoppers do not drop dead immediately upon eating the poison, as it usually takes 24 hours or more for the full effect of the bait to become apparent.

Further information in regard to grasshoppers and their control may be secured from Farmers' Bulletin 747, which will be furnished free to those applying to the Department of Agriculture.

Turkeys Spread Gapeworms.

Turkeys are probably the natural hosts of the gapeworm—a serious pest among young chickens—and are an important factor in their spread.

In the perpetuation of gapeworms from year to year on infested poultry farms the two chief factors appear to be turkeys and contaminated soil. Whether, in the absence of turkeys from a farm, gapeworm affliction among chickens will regularly disappear has not been definitely established, but it seems probable that it may often do so. Gapeworms among chickens appear to be more prevalent on farms where turkeys frequent the chicken runs than on farms where there are no turkeys. Available evidence indicates that gapes has a tendency to disappear on farms following the removal of turkeys. It has been found that chickens, unlike turkeys, are readily susceptible to infection with gapeworms only while they are young. They become less susceptible as they grow older. Adult chickens are seldom likely to spread infection, for in those instances in which gapeworms develop in adult chickens the parasites are likely to live only a short time.

Losses from gapeworms can be greatly reduced, if not altogether avoided, by keeping young chickens on ground that has not been exposed to contamination within at least a year by chickens with gapes or by turkeys and by excluding turkeys from it during its occupancy by chickens. As gapeworms appear rarely to occur in adult chickens, brood hens may be associated with young chickens with little risk of infection. The simplest means of preventing or reducing losses from gapes appears to be the exclusion of turkeys from farms where chickens are raised.

Sunflowers a Good Silage Crop in Some Localities.

Sunflowers are likely to become good for silage material for farmers on irrigated land in the Northwest, according to reports received by the United

States Department of Agriculture from Montana. The Mammoth Russian is in much favor, although experiments have been tried with some of the smaller varieties. The sunflowers were drilled in rows 20 inches apart and irrigated. They were put in about the middle of May, but from their frost-resistant qualities it is believed they could be put in at the same time as grain is sown. About 15 pounds of seed were used to the acre on irrigated land, but it was stated that if sunflowers are to be raised under dry-land conditions the seed should be put in rows 30 to 36 inches apart.

On the project under observation it was intended to let the sunflowers get fairly well matured, about the same as corn, before putting them in the silo, but as a storm broke them down it was necessary to put them in the silo earlier. The yield was from 30 to 40 tons per acre. Cows fed on sunflower silage kept up the usual flow of milk as well as those which were fed on the grain silage. Some of the big Holstein cows ate as much as 90 pounds per day. No unfavorable results could be noticed in the flavor of the milk. While this experiment has not gone far enough to reach definite conclusions, it indicates that sunflowers may be considered a good crop for silage in some localities.

ELEPHANT BUTTE DAM SAVES MILLIONS.

"At this time [April, 1921] there is flowing into the Elephant Butte Reservoir less than 500 second-feet, scarcely enough to fill the Leasburg Canal alone. The snow in the mountains of northern New Mexico and Colorado is almost nothing. The chances are there will be an extraordinarily low spring run, and were it not for the dam we would probably lose our orchards and nearly all the crops.

"This is the third time the dam has saved us several million dollars within a short space of three years, to wit, in 1919 there wouldn't have been enough water to have matured a third of a crop. In 1920 we would have had a flood that would have caused at the very least calculation \$500,000 worth of damage. Instead this valley produced between four and five million dollars worth of crops. The same condition will prevail this year as prevailed in 1919, so that it is seen that in the three years we have been saved from two disastrous drouths and one ruinous flood.

"We repeat again, that if it had not been for the United States Reclamation Service we would either have had no water or a tule swamp. Let us hear no more talk about blowing up the dam.

"Let's boost for the country with the greatest water supply and the best climate in the world."—*Organized Farming, Rio Grande project, New Mexico-Texas.*

APRIL WEATHER IN THE WESTERN STATES.

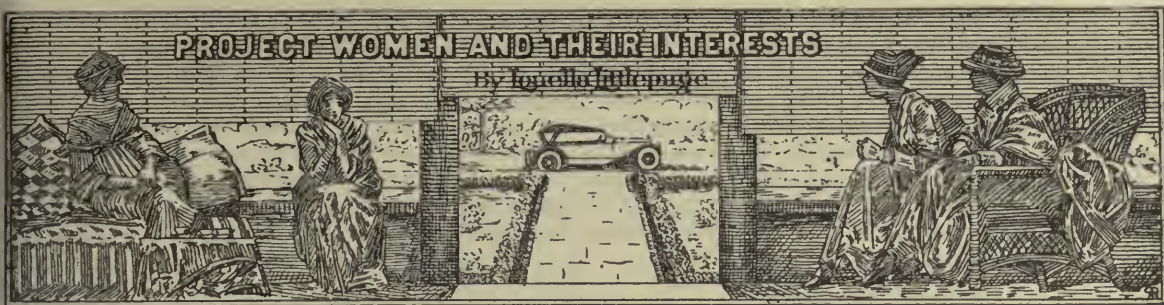
By P. C. Day, United States Weather Bureau.

April in the Western States was mainly cool and dry, but in several districts it was different in one respect or both. As a rule, the first few days were warm, but the early portion of the second week was cold. During the middle and latter portions of the month temperatures were changeable in the Pacific Northwest and in the Rocky Mountain and Plains States; but in the plateau region low temperatures persisted, save in the southern portion, where the final few days were warm, as they were also in California. The entire month averaged just about normal as to warmth in some Pacific Coast districts, and usually a little warmer than normal in Montana and to eastward and southeastward as far as central Kansas. Elsewhere in the West the month was cool, and in the northern and east-central plateau and the central and southern Rocky Mountain regions the deficiency averaged from 3° to 6°. For most of Montana and the Dakotas this was the tenth successive month to be warm, while for the plateau and Rocky Mountain regions it was the first month during 1921 to fall below normal temperature.

There was moderate or sometimes rather heavy precipitation during the first 10 days in many districts north of latitude 40° and near or eastward of the Rocky Mountain Divide. For the greater part of the West, however, the wet portion of the month was the middle decade and the first half of the final decade.

In far western Texas, nearly all of New Mexico and Arizona and all but the more northern parts of Nevada and California April brought very little precipitation or locally none at all. Except in North Dakota there was usually less than normal precipitation in the northern plains, and nearly all parts of Washington and Oregon, and some of western Idaho, had less than normal. There was more than normal, however, in southeastern Idaho, most of Utah and Wyoming, and in many northern counties of Colorado. The snowfall was mainly less than normal in Nevada and adjoining parts of other States, and usually in the northern border States; but it much exceeded the average April quantity in southeastern Idaho and in most of Wyoming and Colorado.

The month's weather was, on the whole, reasonably favorable for outdoor work, more so in southern districts than in northern, particularly in the northern districts west of the Divide. Live stock did not greatly feel the dryness near the Mexican border, but in many central and northern localities the heavy snows and sudden turns to cold weather were bad for young, and for newly sheared sheep. Small grains were favored for the most part, but widespread harm to fruits resulted from low temperatures at various times during the month.



Scrubs.

WE ARE judged by what we have about us. A farmer who keeps scrub cattle on run-down fields, with unpainted buildings, is rightly called backward—a true scrub farmer. A community which tolerates an old-fashioned, unventilated, poorly heated, poorly lighted schoolhouse should be known as a scrub community. In such a school interest is slack and poor methods are commonly used. Out of it will come boys and girls with a scrub education, because they have not had the chance which is their right. The family that lives in an unattractive house in an untidy, uninviting yard these days is a scrub family, because it is now well understood that it doesn't cost anything to remedy these conditions. There may not be money enough to paint the house; the house itself may be but a shack, but shining windows, a tidy yard, a few flowers and vines, and the transformation is complete. The children from such a home possess self-respect and ambition, while the blameless waifs from the former kind usually grow up with but one ambition—to get away as soon as they are old enough to strike out. It doesn't pay in any kind of coin to belong to the scrub class.

Newell Stages Tree-Planting Campaign.

"More than 1,000 trees were planted in Newell on Arbor Day," was the heading in a newspaper on the Belle Fourche project on April 28. The community observance of Arbor Day, closing a campaign for tree planting, was a splendid exhibition of a get-together spirit and an evidence of what a lot of public good can be accomplished at inconsiderable cost when all pull together.

The committee sent for trees for both private and public grounds, securing about 1,000. Many people, in addition to this, secured their own trees, either locally or from nurseries, and it was estimated that during the 10 days immediately preceding and including Arbor Day between 1,500 and 2,000 trees were planted. It is planned to see that these trees are properly watered and safeguarded from injury, and that there will be a repetition of this Arbor Day observance annually for the purpose of replacement and the further extension of the parking system and beautifying of home grounds. It is probable that next year the cemetery will be landscaped and well set with trees.

This announcement called up a vision of Newell 10 years ago. We had driven over from Belle Fourche with Mr. and Mrs. Magruder, stopping at the big dam for an hour and enjoying the hospitality of Engineer Reedy and his wife at luncheon. The plains were parched and dry. There had been three successive years of drought and the dry-land farmers were leaving in tiny caravans for places where they hoped to at least make a living. It was a perfect day for that atmospheric delusion known as the mirage, and more than once we were entranced at the appearance of a glistening, verdure-bordered lake or an inviting village embowered in cool, green trees. It was about 4 in the afternoon when the driver announced that we were in sight of our destination, Newell, the new Government town. It was a bit disappointing just at first, this great, giant handful of rather crude wooden houses standing out solitary and desolate in the endless plain, especially after our all-day association with the dream cities of the air.

But there was nothing disappointing about the "close up." There were two live newspapers published there, three banks which gave an air of prosperity to the place, three general stores, two hardware and two drug stores. Soda water clerks in the whitest of white suits dispensed iced refreshments in the drug stores, and across the street a moving picture house flaunted alluring and colorful posters to entice the inhabitants to seek diversion inside. A telephone system furnished up-to-date communication in the town and with surrounding farmers, while long-distance lines extended to Belle Fourche and the Black Hills. The railroad had not yet been laid through the town, but they showed me a perfectly good depot site. There was an air of eager expectancy about the whole place, and every inhabitant was a booster for the town and for the new lands which were rapidly coming under cultivation. To even the veriest stranger there was one evidence that this was not the proverbial wild West boom, but a town that was building to stay, and that was the crude little church with wide open door and cross shining in the evening light.

To-day the lonesome plain of a decade ago has become a landscape dotted with hundreds of homes,

crossed with bands of steel, and pulsating with the activities of thousands of energetic and prosperous people. The wide expanse of treeless plain which once supported the stockmen's flocks and herds is now planted to cereals, fruits, and vegetables, sustaining hundreds of people on individual farms and contributing to the well being and prosperity of the thriving and up-to-date town which put on such a splendid drive for the adornment and glory of its citizens' abiding place.

A Rose Campaign.

At Hermiston, on the Umatilla project, Oregon, there is a community club that proposes to keep in the very front of the procession of progress. They are now staging a campaign with "Let's Grow a Rose," as their slogan.

Mindful of the prominence of Portland, the "Rose City," attained largely through the advertising value of its rose carnivals, and determined that as far as she goes not even Portland shall surpass Hermiston in loveliness, the Community Club has set about the beautification of its little city in systematic manner.

For 15 years the rose festival has been the most important celebration in the Pacific Northwest, and ranks in beauty and entertainment features with the famous Mardi Gras of New Orleans, and the New Year's Day floral parade at Pasadena. Two great parades will be held this year. The floral parade, always a thing of marvelous beauty, will this year be made even more attractive by the addition of new features. The automobile section is expected to include at least 300 handsomely decorated cars. The industrial and port development parade will be designed to depict Portland's growth as an industrial and shipping center. The annual rose show will be put on for three days, June 8-10, in the municipal auditorium; competitors from all rose-growing sections of the United States will enter blossoms for the contest. The American Rose Society's principal test garden is located in Portland and is expected to produce some new and wonderful roses for the event. Several new roses will be named during the show.

To get back to Hermiston and her campaign, they have selected yellow as their specialty. In their particular locality there are certain types of roses the attempted growing of which is a waste of time and money, and they are urging residents to work for a satisfactory rose to identify with their community; in other words, a community rose as a feature like the Caroline Testout for Portland so beautiful in June with parkings and yards pink with Testout blooms. One of the club members says they want to grow a grand, great big fragrant yellow rose, one that will reflect their 365 days of sunshine, and send out such a glow of color and perfume as will linger in the minds of all beholders and bring them back again to Hermiston.

No other color, it is claimed, will stand up against hot sun and drying winds like yellow, and there are so many beautiful shades from dainty pinks to deep burnt orange. They bloom earlier, are more fragrant than other kinds, and do not have the tendency to fade and turn brown like so many other colors.

The Community Club will try out several varieties and then select judges to make notes on their various qualities suitable to their climate.

The Community Club, however, is not devoting its entire time to the growing of roses. They are hunting the last fly to his lair; they have cleaned up and painted up the town, and now they are urging that vacant lots and useless spots in the city be planted to useful vegetables.

More power to them.

Why Not Specialize?

A little story of how two brothers in Illinois have grown wealthy growing pop corn should serve as an inspiration, especially to women and children who are fortunate enough to be living on farms.

The pop-corn boys began in a very small way, but persistently worked to produce just the best pop corn that would grow. Almost before they knew it they were enjoying a nice income, and now they are rich men, but still they grow around 100 acres of pop corn each year, which finds a ready market. One hundred acres, they say, is just enough to play with in spare moments, but many times that number of acres would bear no more than they could sell. It is the quality of their product, not the quantity which insures their market.

It doesn't so much matter what product one selects for a specialty, but it must be just a little better than the average output.

A recent editorial in a Yakima project newspaper furnishes a splendid suggestion for women who desire to increase their income. It is the breeding of game birds for food. It is said to be but very little more work to raise wild geese or ducks, pheasants, grouse, or quail than the common variety known as barnyard fowls, yet these game birds will bring ten times the price one can get for chickens for either food or breeding purposes.

No domestic fowl can equal in flavor some of the wild birds, such as quail, for instance, and even if one did not care to take up the work on a commercial scale, a few wild birds would make a delightful variation for the farm table where it is not always possible to procure fresh meat. The laws prohibiting the killing of certain migratory birds does not apply to the breeder who raises the birds himself.

Sometimes it hardly pays a woman to take chickens to market during the regular season, but a brace of pheasants or quail would bring top-notch prices any time at hotels or private homes.

Speaking of specializing, the Yakima Valley, Wash., boasts a woman who owns and manages a 2,000-acre sheep ranch. Mrs. Vessey's business activity, according to other Yakima sheepmen, is most interesting. On her ranch there are now over 6,000 ewes and lambs, and she personally conducts the business affairs. During the summer months she makes daily inspection of all camps on her ranch by automobile. She recently addressed the convention of Washington woolgrowers in defense of the herders.

A 5-cent Piece, and How it Grew.

Once upon a time there was a boy who wanted to raise pure-bred stock. This is a true story. The boy's name is Van Palmtree, and he lives at Panola, Miss. Now, Van had no money, but one day his teacher rewarded some especially good behavior by presenting the boy with a nickel.

A nickel means little to the ordinary boy these days, but to Van it meant a herd of pure-bred cattle. With it he bought a chicken. The chicken was crippled, hence its low price, but much coddling on his part saved its life and it grew to maturity. The next summer she raised a brood of chickens which sold for \$1.50. With this money Van bought a poor little runt pig. A few months care and good feeding made the pig well worth the \$9.36 for which its owner sold it.

Immediately the young financier bought a heifer calf with the money paid him for the hog. Last year, and again this she presented her owner with a heifer calf, so that he now has a little herd of three, all the outgrowth of that one nickel which he invested four years ago.

Van's cattle are scrubs, but he is determined to increase his herd until its sale will bring the money required to at least make a payment on his first pure bred. His success is a foregone conclusion.

Home Nursing Course.

The Montrose County High School, Uncompahgre project, Colo., has been running a course in home nursing that should be followed everywhere. The class was formed for the girls who wished to protect their families from preventable diseases, and who were anxious to fit themselves for service in the absence of a trained nurse. They were also interested in maintaining the health of their neighbors and community.

Before the war this work in England, Sweden, and other European countries decreased the death rate noticeably in all ages, and the proper instruction is sure to check or prevent degenerative diseases here. It is highly important, indeed, that the causes of these diseases be better understood.

The school had lectures and demonstration in nursing; they studied contagious diseases, how the germs are carried, and how their distribution can be prevented; they were instructed in methods of furnishing the sick room simply; how to make a bed, change the sheets, turn patient and mattress; how to give various baths, rubs, etc. One of the most interesting phases of the work was a study of the proper care of babies.

A Shower Bath.

After a hot, dusty drive or a long, hot day in the field or garden what is so refreshing or restful as a hot bath or cold shower, or both? An increasing number of rural homes are now built with some kind of a pressure water system, but there are still thousands of farm homes which have no facilities for bathing except a basin or a tub which must be laboriously filled by hand.

An ingenious Oklahoma farmer has set up a shower bath in his back yard, which is being widely copied by his neighbors, many of whom consider it indispensable. It consists of four uprights set 5 feet square at the base and tapering to 20 inches at the top. Both floor and roof are of solid planking. The uprights extend 7 feet above ground. On the top is a water can; a pickle keg or half barrel will do. A piece of garden hose is attached to the spigot and runs through a hole in the planking, projecting 3 or 4 inches below. On the end of this is a sprinkler from a garden watering pot, and a common spring clothespin shuts off the flow of water. The walls of the inclosure are of sacking. A small ladder is built at one side and the keg is filled with water when necessary. In summer the heat of the sun is sufficient to warm the water pleasantly, and a tight cover keeps out bugs and dirt.

One artistic neighbor put chicken wire around the place, on which morning glory vines clamber. The overflow of water keeps them fresh, and the otherwise rather ugly contraption became a real thing of beauty.

Olathe (Colorado) Day.

This is Olathe Day for the Reclamation Record Cook Book sure enough, and the list of good things from the Uncompahgre project should be an inspiration if not a challenge to other sections. It'll be hard to beat 'em without cheating! See next page.

Although it is four years and more since I left the Service I would not be without the RECORD. It brings back the smell of the sage and the light on the mountains, and gives me a picture of the day-by-day activities of "old familiar friends."—*C. F. Carpenter, Rockaway, N. J.*

Reclamation Record Cook Book.

[All the recipes in this issue were sent by Olathe women.]

VELVET SHERBET.

By Mrs. E. G. Dennis, Uncompahgre project, Colo.

3 lemons. 1 pint sugar.
1 quart new milk.

Strain juice of lemons, add sugar, then milk, and freeze. Turn slowly at first, then very rapidly until stiff. The freezing is the all-important thing.

PINEAPPLE PUDDING.

By Mrs. Ida Duncan, Uncompahgre project, Colo.

1 cup sugar. Whites two eggs beaten stiff.
1 can shredded pineapple. 1 envelope gelatine.

Put 1 cup cold water in gelatine, let stand five minutes, then set the dish in another dish of hot water just till it dissolves, not hot. Then stir all together, whipped cream and all, and put in cool place to harden.

OLIVE CHERRIES.

By Mrs. Ida Gibson, Uncompahgre project, Colo.

Use any kind of sweet cherries. Wash, put in glass jars. Take 2 tablespoons of salt to 1 quart cold water, fill jars with the liquid and seal.

JAM CAKE.

By Mrs. W. H. Pedicord, Uncompahgre project, Colo.

1 cup brown sugar. 1 teaspoon soda.
 $\frac{1}{2}$ cup butter. 2 cups flour.
3 whole eggs. Lastly add 1 cup jam.
4 tablespoons sour cream.

CAKE FILLING.

By Mrs. E. M. Rippey, Uncompahgre project, Colo.

2 quarts canned pears, 1 pound walnut meats.
shipped. 3 pounds sugar.
1 pound figs.
1 pound raisins seeded and
cut in two.
Cook 1 hour, when it is ready for use.

MARSHMALLOW CREAM.

By Mrs. Ida Duncan, Uncompahgre project, Colo.

One envelope gelatine dissolved in $\frac{1}{2}$ cup cold water. Add 2 cups hot water and 1 cup sugar, 1 pint of whipped cream, and 1 cup nut meats. Put marshmallows in while warm and beat well, then let set and get quite thick before adding the cream. Shredded pineapple adds to it.

BOILED SALAD DRESSING.

By Mrs. Casner, Uncompahgre project, Colo.

$\frac{1}{2}$ cup vinegar. 1 dessert spoon of flour.
 $\frac{1}{2}$ cup water. 3 eggs.
1 teaspoon salt. 1 tablespoonful melted butter
or olive oil.
1 teaspoon mustard. 1 cup cream.
1 tablespoon sugar.

CORN MEAL PIE.

By Mrs. Proffitt, Uncompahgre project, Colo.

1 cup sugar. 2 eggs.
 $\frac{1}{2}$ cup butter. 2 heaping tablespoons corn
meal.
 $\frac{1}{2}$ cup sweet milk.
 $\frac{1}{2}$ cup nut meats.

Flavor with vanilla and bake in one crust.

NUT BREAD.

By Mrs. R. V. Adler, Uncompahgre project, Colo.

2 $\frac{1}{2}$ cups flour. $\frac{1}{2}$ cup white sugar.
2 $\frac{1}{2}$ teaspoons baking powder. $\frac{1}{4}$ cup walnut meats.
1 egg. Pinch salt.

Let rise 10 minutes and bake about 30 minutes.

PLAIN CORN BREAD.

By Mrs. H. G. Carkhuff, Uncompahgre project, Colo.

1 cup buttermilk. 1 teaspoon shortening.
 $\frac{1}{2}$ teaspoon soda. 1 egg.
 $\frac{1}{2}$ teaspoon salt. 2 tablespoons flour.

Corn meal to make about the consistency of cake dough.

STEAK WITH TOMATOES.

By Mrs. Dietz, Uncompahgre project, Colo.

1 pound steak, any kind, 1 pint tomato sauce sea-
soned to taste.
about 1 inch thick.

Put steak in iron skillet after dredging it in flour and seasoning. Pour seasoned tomato sauce over steak. Roast in medium oven from one to two hours.

APPLE FRITTERS.

By Mrs. Ferguson, Uncompahgre project, Colo.

1 egg, beaten. 1 cup flour sifted with 1 tea-
spoon baking powder.
1 cup milk.

Stir milk and egg together, add flour, then a cup of diced apples, and then rest of flour until batter will drop from spoon. Fry in deep fat and serve with syrup.

CREAM PUFFS.

By Mrs. Leon Hoodley, Uncompahgre project, Colo.

One cup of flour stirred into 1 cup of boiling water into which a teaspoonful of butter has been added. When cool add four eggs, one at a time. Bake in spoonfuls for 30 minutes. Fill with whipped cream sweetened and flavored to suit.

RAISIN PIE.

By Mrs. E. E. Newell, Uncompahgre project, Colo.

1 cup raisins chopped fine. 1 pinch salt.
 3 cup sugar. 1 teaspoonful vanilla.
 1 cup sweet cream.

Mix all together, then beat white of one egg very light and add. Bake in two crusts.

MOCK ANGEL FOOD.

By Mrs. T. E. Veirs, Uncompahgre project, Colo.

1 heaping cup flour. 2 level teaspoons baking
 1 cup sugar. powder.
 1 heaping tablespoon corn
 starch.

Add one cup scalding milk, fold in last the whites of two eggs.

GRAHAM CRACKER PUDDING.

By Mrs. Walter Carkhuff, Uncompahgre project, Colo.

12 graham crackers. 1 cup raisins.
 1 pint milk. 1 cup sugar.
 1 beaten egg.
 1 heaping teaspoon cinnamon.

Butter size half an egg. Cook in double boiler one and one-half hours and serve with whipped cream or any pudding sauce.

PRESSED MEAT WITH EGGS.

By Mrs. Mary O. Dennis, Uncompahgre project, Colo.

Cook 3 or 4 pounds of beef. Grind and season well. Boil down meat liquor and our over ground meat; can add a little gelatine to insure firmness. 6 or 8 eggs boiled hard, whites and yolks chopped separately. Put half of meat into dish, add layer of chopped whites, all the yolks, then balance of whites, pouring a little melted butter over all. Add remainder of meat, cover and press for several hours in cool place.

DIARY OF A WESTERN BOY IN EUROPE—Continued.

By William E. Smythe, Jr.

CHAPTER VIII. FOUR WEEKS AT SEA.

IT was mid-afternoon when the great ironwork of the aerial ferry at Newport hove into view and 4 o'clock when the train pulled into the station at Cardiff. I went directly to the Shipping Board headquarters and made the final arrangements for my return to America. I found that I was to sail two days later from Newport for New York.

After settling my luggage in a moderate-priced hotel I strolled around the town. The most interesting thing I found was the old Cardiff Castle with its ancient moat, which is now used as a part of a long canal that brings coal down from the hills. The Civic Center is one of the finest in England, and looks very modern. Wide tree-lined streets lead back from it and there is a beautiful park between it and the business district.

The remainder of the day and evening passed very quickly, and the next afternoon I went to Newport and boarded the *Indiana Bridge*, where I was given a neat little stateroom. I settled my belongings and prepared for the 14 days at sea.

Late on a beautiful Saturday afternoon we steamed out of Newport Harbor by way of the largest lock in the world, with the exception of the one in the Panama Canal, and into the wide Severn. I was almost as excited as I had been eight weeks before when I had sailed from Baltimore, because I was starting home after a very lonely though interesting and for the most part enjoyable time. A number of ships, all freed from the same lock, raced with us

down to the sea. The green hills and gray cities of Newport, Cardiff, and Barry grew less and less discernible in the twilight, but after all the rest had become a part of the indistinct sky line there loomed the great steel structure of the aerial ferry at Newport.

All day Sunday we churned our way down the Bristol Channel and that night passed the last light-house and left all traces of land to sternward. The ship, high out of the water, traveled in ballast, and vibrated mightily when it entered the open sea. I spent much of my time thinking of my eastbound voyage, when I had sailed from Baltimore on the *Monmouth* as an ordinary seaman in the fo'c'stle. In order to give my readers a fresher account of my trip on the *Monmouth* I will insert a few pages of my diary:

I start these papers on Sunday, the 18th of July, 1920, aboard the freighter *Monmouth*. The weather is cloudy and the sea is calm. I am writing in the fo'c'stle while some are sleeping in their bunks and others sit around on benches and talk.

I came aboard for the first time last Monday night, and found a very dirty ship indeed. The decks were cluttered with lumber, oil, and ashes, and flies and cockroaches were everywhere. The temperature was about 90° in the shade. I stripped, crawled into my bunk, and spent a miserable night tossing and swatting flies.

We passed through Hampton Roads and plowed into the open sea at 2 bells of the morning watch, or, as they say on land, 5 a. m. Saturday the work consisted of throwing ashes overboard and then washing the decks from bow to stern.

Sunday, July 25, still at sea. Last Sunday afternoon every one of the ordinaries except myself took a turn at the wheel. I spent the afternoon reading a story in a popular magazine, but this afternoon I shall try my hand at steering, too. Monday we were introduced to the worst concoction on shipboard. The seamen call it soogy, but I can find no words to express it. It is made of lye and some acid and about half water. It is applied with a bit of waste, and burns sores in the hands and turns the finger nails dark brown. It is used to wash the gray paint around the ship.



The author in England.

Tuesday we were put to work overhauling and greasing the blocks in the afterhold, and I sang the Mount Diablo song all day as I worked. Wednesday we scraped and painted decks. Tuesday we helped the mate scrape and sandpaper teakwood doors.

Last evening I played poker for three hours, first with one bunch and then with another, but no real money was put up. To-day I have done some washing and reading. We are due to land at Avonmouth next Saturday.

Monday, August 2. It is rainy and soggy weather and I am sitting on a bench aft while I write this diary. Last Sunday afternoon I took the wheel for two hours and enjoyed it very much. Steering is very simple, but one must keep his mind on the compass all the time. Monday

morning we were awakened early by the incessant whistling of the fog horn. On going on deck we found that we were surrounded by a thick fog and could only see a few hundred feet ahead of the bow.

That afternoon after work the captain called me up on the bridge and looked me over then said, "Wouldn't your father like to see you now?" and "you'll have to wash up before you go to Essex." Of course I had just come from fish-oiling the gear and was very dirty. That morning the mate had asked me if I wanted to get off at Avonmouth in order to go to Essex direct. I had told him that I thought I would rather, if possible, and it was on this business that I had been called to the bridge. The captain told me that he would arrange it as I wished.

Thursday morning the fog got so dense that the ship was obliged to stop every few minutes, whistle, and then go on. On one of these occasions when the engine started there was an explosion and a great volume of steam poured out of the engine room hatches. We felt rather shaky and one of the sailors said, "There goes a cylinder head." But an hour later we were under way and a fireman said that it was just a piston spring that blew out. That night we were supposed to sight Fasnet Light, but the fog was so dense that we must have passed it without knowing it.

At 4 o'clock the next afternoon the fog lifted and we saw the green hills of Ireland only 5 miles away and they certainly looked good to all hands. We had been taking soundings for the past 36 hours and we were mighty glad to quit, for it was back-breaking work cranking in 60 fathoms of line every half hour.

Saturday morning the high shores and chalk cliffs of England hove into view, and at 2 p. m. we took on the pilot at the mouth of Bristol Channel.

The trip back seemed much longer because I had nothing to do but read, eat, and sleep. The weather was fine all the way until we were within two days of New York and then, as the captain had predicted, we ran into a heavy fog. It continued all one day but seemed to clear up in the early evening, when ships were on all sides of us. I went to bed with the happy assurance that the next day I would be able to set my feet on good American soil. Not that I had got especially tired of the sea, for it's all right for a trip once in a while, but I must admit that I never desired to lead the life of a sailor.

I was awakened at 2 o'clock the next morning by numerous rather startling sounds. The fog horn was blowing short spasmodic blasts, bells were ringing in the engine room, and every once in a while a sharp sound of hissing steam would be heard, followed by commands to men in the engine room. Naturally, being unaccustomed to such sounds, and feeling that I was the only one in bed, I felt rather eerie. However, I was somewhat quieted when I looked out of my port hole and found that the fog had again settled around us for I knew that we must be very close to the entrance of New York Harbor, where ships are very numerous. I was able finally to get to sleep.

In the morning I imagined I felt more calm than any of the crew, for on going out on deck I found that all the men who were off duty had gathered in a little group at the starboard rail straining ears and eyes in the hopes of getting some news of the lightship. I

talked with the chief engineer and learned that he had had trouble with the boilers all night. They had been leaking, and he could fix them only temporarily; in fact, he thought the matter so serious that he had urged the captain to wireless the New York office that he was coming in in spite of the fog.

After breakfast I received a wireless from my father, who said he would be waiting for me at the dock. It was some time after noon that we heard the unusual but welcome sound of the foghorn on the lightship. We progressed slowly and early the next morning took on a pilot from the *Sandy Hook*.

The fog lifted in time for us to see Long Island, Staten Island, and finally Coney Island. We waited four hours for the immigration and customs officials and the quarantine. It was 5 o'clock when we again started up the harbor. I went to my stateroom and made my preparations to go ashore. Being proverbially slow, our ship was passing the Statue of Liberty before I had finished shaving, and there in the soft light of late afternoon I saw the inspiring Statue of Liberty reflected in my shaving mirror and I knew that I was home.

(The end.)

BENJAMIN A. FOWLER, 1843-1921.

BENJAMIN A. FOWLER, who died at Long Beach, Calif., on April 11, 1921, was born at Stoneham, Mass., December 14, 1843. He graduated from Phillips Academy, Andover, Mass., in 1862; served in the Signal Corps, Fiftieth Massachusetts Volunteers, 1862-63, under Gen. Banks, participating in the siege of Port Hudson; and received the degree of B. A. from Yale in 1868. He was in the subscription and publishing business in Boston, New York, and Chicago from 1872 to 1899.

a member of the Arizona Legislature in 1901, president of the Arizona Agricultural Association, 1900-1901, the Phoenix Chamber of Commerce, 1902-3, and the Salt River Valley Water Users' Association, 1903-1910, secretary of the Sixteenth and Seventeenth National Irrigation Congresses, 1908 and 1909, and president of the eighteenth and nineteenth congresses, 1910 and 1911.

Mr. Fowler was a type, and a remarkably good type, of the sort of citizen that has given the far West the large influence it now enjoys in national affairs. He was a New England man transplanted to the desert half of the continent, carrying his ideals with him.

His arrival in Salt River Valley was almost contemporaneous with the passage of the reclamation act. With the proverbial zeal of the new convert he threw himself into the movement which aimed to make Tonto Basin and the Salt River Valley of Arizona one of the earliest fields for the expression of the new national policy. Both in Arizona and in Washington he worked tirelessly and successfully to this end. He had the great pleasure and honor of presiding at the dedication of the Roosevelt Dam. Theodore Roosevelt was present, and said he would ask no other or better monument. It is a monument as well to B. A. Fowler, to his love for the West, and for humanity.

After his successful efforts in organizing the Salt River Valley Water Users' Association, he was employed for nearly a year by the Reclamation Service for the purpose of visiting some of the northern projects and explaining to them the requirements in connection with such organizations and assisting them in putting through the necessary documents. Mr. Fowler was one of the loyal friends of the service and in presenting questions affecting his own project was always fair-minded and open in the discussions.

One of his friends and admirers has well said that "if there should be subtracted from the sum of western achievement the contribution of men of the Fowler type of mind, the vacuum resulting would be appalling."



Benjamin A. Fowler.

Mr. Fowler then removed to Arizona, and was engaged in ranching near Phoenix until 1916. He was

"GET ACQUAINTED" WRITE UPS.

Hon. Edward C. Finney, First Assistant Secretary of the Interior.

EDWARD C. FINNEY, appointed recently by Secretary Fall to the position of First Assistant Secretary of the Interior, was born in Pennsylvania. He removed to Kansas with his parents in 1880 and lived on a farm in Douglas County, Kans., from 1880 to 1891, when he graduated from the University of Kansas. He practiced law in Kansas from 1891 to 1894, and is a member of the bar of the Supreme Court of the United States and Supreme Court of the State of Kansas.



Hon. Edward C. Finney.

Mr. Finney was appointed in the General Land Office through competitive civil-service examination in 1894, where he served for a number of years as examiner of mineral claims and contests. During the Taft administration he was Assistant to the Secretary and chief law officer of the Reclamation Service, and prior to his appointment as First Assistant Secretary he was a member of the Board of Appeals, Department of the Interior.

Mr. Finney has helped formulate the potash, coal, oil, and phosphate leasing laws, the water-power act, and other legislation dealing with public lands and

resources, and has frequently represented the department before committees in Congress in connection with Interior Department matters.

For the last 12 years Mr. Finney has handled, as adviser of the Secretary, nearly all matters relating to the Reclamation Service upon which the department's action has been required, has shown throughout a genuine sympathy with the work and the objects of the Service, and also unusual efficiency.

Cooperation Pays.

Mr. H. H. Brook, president of the Elephant Butte irrigation district, Rio Grande project, writing in a recent issue of *Organized Farming*, says:

"The interests and purposes of the reclamation law are to benefit the people—demanded by the people—and the success of the officers of the Service depends on their carrying out the intent and purpose of the law. Isn't it reasonable, then, to assume that the desires of the people and the intent of the Reclamation Service can be brought to coincide—the people to get what they want and the Service to carry out its purpose without conflict? We know it can. In fact, this understanding [to the effect that lateral construction work will in the future be determined in general by joint agreement between the district and the Reclamation Service] can and will accomplish it.

"The obstructionists will say, 'Supposing you do get what you want, it will cost twice what we could do it for.' This is debatable. With Government freight advantages, rigid inspection, large quantity purchases, central purchasing agency, permanent organization at comparatively low salaries, other Government privileges, and no profits at all, it is very, very doubtful whether this is true.

"But for the sake of argument let us admit that it is true; the policy of obstruction is not justified, is rotten judgment, and shortsightedness for two reasons:

"1. If the farmer had to finance the work that has been done and will be done, it would cost him two and a half times the original cost in interest by the time he paid it off.

"2. There is not a farmer in the whole project that has not lost more per acre than the entire announced project cost of \$90 on account of previous policy of obstruction and delay in loss of crops and land by seepage.

"Moreover, we know that the Government has saved half a million dollars in drainage construction alone, which would make up for a lot of mistakes."



The Smoot Rural Homes Bill.

THE following is the text of the Smoot Rural Homes Bill (S. 491), introduced in the Senate April 12, 1921, by Hon. Reed Smoot, of Utah:

A BILL

To provide, without expenditure of Federal funds, the opportunities of the people to acquire rural homes, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Interior, through the Reclamation Service, is authorized to investigate and determine the feasibility of developing tracts of land in private ownership, by reclamation and otherwise, for the purpose of subdividing the land and disposing of the same in farms and parcels at reasonable prices.

SEC. 2. That after the Secretary of the Interior has determined the feasibility of a project, he is authorized, through the Reclamation Service, to develop the land to such extent and dispose of the same in farms and parcels in such manner and upon such terms as to him shall be deemed most feasible and practicable.

SEC. 3. That no moneys of the United States shall be expended for any of the purposes of this act, nor shall either the investigation or development of any project be commenced or any obligation incurred therefor until a contract shall have first been made by the Secretary of the Interior with the owner or owners of the land, or a district or other organization representing such owners, providing for the payment in advance to the United States of sufficient moneys to meet the estimated cost, and thereafter of sufficient moneys to meet the actual cost of such investigation or development and no expense shall be incurred by the Government in excess of moneys already advanced. All time given by any officer or employee of the United States on account of any such contract shall be charged against such contract. The moneys provided by every such contract shall be deposited in the Treasury of the United States as a trust fund, and shall be disbursed by a duly authorized fiscal officer of the Government under the direction of the Secretary of the Interior and in accordance with the terms of such contract.

SEC. 4. That every contract for development of a project shall provide, among other things, that the developed farms and parcels shall be sold to persons who desire to occupy the same as homes at the actual cost of the land and the development thereof plus a definite reasonable profit to the owner or owners stated in advance therein. If any landowner shall, in any such contract, reserve from disposal hereunder a

farm or parcel of his lands for his own home, the same shall be subject to the payment of such construction charge as may be equitably apportioned against it on account of the development of the project. All contracts for the purchase of farms and parcels, and the proceeds therefrom, shall belong to the owner or owners of the land or their assigns.

This bill has received the approval of the Department of the Interior in a letter dated May 5, 1921, signed by Hon. E. C. Finney, Acting Secretary. The letter follows:

DEPARTMENT OF THE INTERIOR,
Washington, May 5, 1921.

HON. REED SMOOT,
Chairman Committee on Public Lands,
United States Senate.

MY DEAR SENATOR: I acknowledge receipt of letter of April 23, 1921, from Mr. Logan Morris, clerk of your committee, stating that you desire such suggestions as I may see fit to give in reference to S. 491, "A bill to provide without expenditure of Federal funds the opportunities of the people to acquire rural homes, and for other purposes."

This bill authorizes the Secretary of the Interior, through the United States Reclamation Service, to make contracts, first, for the investigation, and later, if found feasible, for the construction of projects for the reclamation and development of lands in private ownership located throughout the United States. The proposed legislation is unique in that it does not call upon the Public Treasury for any funds not even for preliminary investigations or for the time given by Government officials to consideration of projects. First, the estimated cost, and subsequently the actual cost, both for investigations and construction, must be deposited with the United States in advance before any expense is incurred by the Government.

The Secretary of the Interior is empowered, after reclaiming and developing the lands, to provide for their sale to home seekers, and he is enabled to limit the returns of the original landowners to a reasonable profit definitely stated in advance in each contract providing for the development of a project, in this manner promoting and safeguarding the interests of the home seekers settling upon the land so developed.

There is probably no greater domestic problem confronting the people of the United States at the present time than the one which relates to the healthful growth of our rural life. The census of 1920 shows that our cities are growing proportionately many times faster than is the country. Between 1900 and 1910 the number of farms in the United States increased 10.9 per cent, while between 1910

and 1920 they increased only 1.4 per cent. At the present time less than 50 per cent of the population of the United States live in rural communities. The tendency to farm abandonment, which began in New England many years ago, has extended steadily westward, and now involves nearly every State of the Middle West. The annual growth of our population has been about 2 per cent, and if our area of cultivated land were to be similarly increased, instead of abandonment of any land, about 17,000 acres would have to be added to this area every day of the year, or over 6,000,000 acres annually. So large an increase in cultivated area, however, is not being required because of improved methods of cultivation, but these do not afford a solution of the problem; nor does the greater use of labor-saving machinery, which reduces the number of individual workers required. The agricultural history of the New England States is illuminating. These States once were self-sustaining, but they now are dotted with abandoned farms, while 75 per cent of their food products come from outside their borders.

It is of vital importance to the welfare of America that this trend to the cities be checked, for unless this is done we shall cease to be a self-sustaining nation, and shall be obliged to depend upon the foodstuffs of other nations for our sustenance. I believe our fixed policy always should be to produce within this country a generous supply of everything needed to support life.

A forward-to-the-land movement would not only be important in relation to food production but it would benefit the Nation in many other ways. Principal among such benefits would be an alleviation of social unrest and an insurance against the menace of bolshevism and kindred evils, which find no root where the citizen lives close to Mother Earth in a home of his own.

The causes of this unwholesome trend from country to city should receive the most careful study of our statesmen. It seems to me that one of the reasons for this trend is an altogether too common barrenness in the social and spiritual life of the country. We should bring to the farm more of the comforts, conveniences, and inspirations of the modern world. Education, religion, entertainment, social intercourse, physical and mental health, all these to which so much attention is given in the city, should receive a like attention in the country, so far as is practicable. A second reason, I believe, for this breakdown in rural life arises from the economic waste that comes from unorganized and misdirected agricultural effort, which renders farming unprofitable as well as unpleasant. These causes may in a great measure be removed through an intelligently planned rural development. A better farming morale may be secured through well-organized cooperative buying and selling agencies in rural settlements.

The public agricultural lands of the country, once seemingly boundless in extent, are becoming exhausted, and in future development upon the soil, with the exception of irrigable public lands in the West, we shall have to deal largely with lands now in private ownership. There are throughout the country large areas of these lands, now unproductive, which may be turned into homes for our citizens through reclamation and development.

The Reclamation Service is a well-organized bureau which has dealt largely with the problem in question in connection with Federal irrigation in the West, and with such success as to command confidence. This experience, obtained under a variety of physical

and climatic conditions, has developed a body of trained men equal it would seem to any constructive task which might be assigned to it in connection with reclamation and settlement in any part of the country.

The plan of this bill is not paternalistic. It would encourage the development of agriculture according to the same principle under which we have for years encouraged the development of our manufacturing industries. The Government would merely give the farmer a protection against odds that are too burdensome from a practical standpoint for him to carry alone and unaided. Through the services of a body of engineers, builders, and administrators, not working for profit, the homeseeker would be assured as to the feasibility of the project where he desired to make his home. He would know that the improvements promised would be made, and he would be able to secure land at a reasonable price and would himself get the benefit of any increase in value.

It ought to be possible under this bill to develop waste land so that it could be disposed of to settlers at a saving over prices now ordinarily paid for small rural holdings. The reasons for this would be that the original landowners would enter into contracts for the sale of their property on a prereclamation basis, and the usual charges of sales agencies could be practically eliminated. This saving to the settler would frequently change what would otherwise be a failure into a success.

I have been informed that if this bill is enacted there will be an early opportunity to develop under its provisions several projects located in different parts of the country.

I would suggest a minor change in the caption of the bill by substituting for the word "provide" the word "increase."

I am of the opinion that the bill should be enacted.

Sincerely,

E. C. FINNEY,
Acting Secretary.

Foreclosure of Government Lien for Water Charges.

Section 2 of the act of August 9, 1912 (37 Stat., 265) provides for the automatic transfer from the owner to the United States of title to certain lands subject to the payment of Federal irrigation charges, the day following a delinquency in payment. Representative M. P. Kinkaid, of Nebraska, introduced in the House on April 11, 1921, a bill (H. R. 2425) which would substitute a statutory foreclosure under State law in place of the automatic transfer. The text of the bill follows:

A BILL

To amend section 2 of the act of August 9, 1912 (37 Stat., p. 265), relating to liens in patents and water-right certificates.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section 2 of the act of August 9, 1912 (37 Stat., p. 265), entitled "An act providing for patents on reclamation entries, and for other purposes," be amended to read as follows:

"Sec. 2. That every patent and water-right certificate issued under this act shall expressly reserve to the United States a prior lien on the land patented or for which water right is certified and on all water rights appurtenant or belonging to such land, which

lien shall be superior to all other liens, claims, or demands whatsoever. This lien shall be reserved to secure payment of all charges for construction, supplemental construction, operation and maintenance, water rental, or for other water service against the land due or to become due to the United States or its successors in control of the irrigation project, together with the penalties for delinquency provided by the act of August 13, 1914 (38 Stat., p. 686). Such lien may be foreclosed in accordance with the provisions of the State law relating to the foreclosure of real estate mortgages. Every sale under such foreclosure shall be made subject to a continuance of the lien provided for herein."

Secretary Fall has approved the proposed legislation in the following letter:

DEPARTMENT OF THE INTERIOR,
Washington, May 2, 1921.

HON. MOSES P. KINKAID,
Chairman Committee on Irrigation of Arid Lands,
House of Representatives.

MY DEAR MR. KINKAID: Receipt is acknowledged of your letter of April 20, 1921, inclosing copy of H. R. 2425, with request for report.

This bill is entitled "A bill to amend section 2 of the act of August 9, 1912 (37 Stat., p. 265), relating to liens in patents and water-right certificates."

Section 2 of the act of August 9, 1912, provides for the enforcement of a lien reserved to the United States under that act to secure payment of water charges under Federal irrigation projects. Immediately upon default in the payment of any such charge the title to the land at once automatically passes from the water user to the United States free of encumbrance. The land may be redeemed within one year upon payment of the delinquent account with 8 per cent interest and costs. Upon failure to redeem the United States may sell the land, and from the proceeds of sale liquidate the delinquent account, and return the balance if any to the defaulting debtor or his assignee. Apparently, the United States may retain the title if the Secretary of the Interior so desires, and a sale need not be had. If the land is sold by the United States the Government may bid in the land for not more than the charges which it has against it.

It will be noted that the act of August 9, 1912, provides for 8 per cent interest on delinquent accounts together with costs, while the extension act of August 13, 1914 (38 Stat., 686), provides for a penalty of 1 per cent per month on delinquent accounts.

The bill in question would apply the penalties of the extension act to cases coming under the act of August 9, 1912, and would thereby make uniform all penalties for delinquency on Federal irrigation projects. The bill would also substitute a statutory foreclosure in accordance with State law in place of an automatic transfer of title immediately upon failure to make payment.

The provision of the present law relating to an automatic transfer of title is of questionable constitutionality and is awkward in its application, to say the least. If a water user fails to pay a construction charge on December 1, the date when it is due, under this law the title to his land passes to the United States the next day, and then if the water user pays the account the following day, title returns to him. This flitting back and forth of the title to real estate may occur twice a year as to each farm—

once in connection with payment of construction charges and again in connection with payment of operation and maintenance charges. All of these transfers take place without any showing upon the county records.

In case of failure to redeem within one year the option is given to the Government to retain full title to, say, a \$10,000 farm with a \$100 water charge against it, or sell the farm and pay the charge from the proceeds and return the balance to the owner. This awkward, drastic, and inconsistent arrangement serves no useful purpose to the Government, is an annoyance to the landowner, and clouds his title in such a manner as to make it difficult at times for him to secure loans upon the land. The Government, having a first lien for its water charges, ought to be satisfied with the same remedies for the collection of those charges that a conservative investor has for the collection of a farm mortgage. These Government liens do not become effective until after the land has been improved, and it would seem that under those circumstances a first lien for the comparatively small amount of water charges, subject to the usual rules of foreclosure, would be as gildedged a security as one could reasonably ask.

I am of the opinion that Congress should take favorable action upon this bill.

Sincerely,

ALBERT B. FALL, *Secretary.*

Federal Irrigation Water for Delinquent Applicants.

JOINT RESOLUTION.

To authorize the Secretary of the Interior, in his discretion, to furnish water to applicants and entrymen in arrears for more than one calendar year of payment for maintenance or construction charges, notwithstanding the provisions of section 6 of the Act of August 13, 1914.

[Res. No. 52, approved May 17, 1921, 42 Stat. —.]

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That in view of the financial stringency and the low price of agricultural products, the Secretary of the Interior is hereby authorized, in his discretion, after due investigation, to furnish irrigation water on the Federal irrigation projects during the irrigation season of 1921 to water-right applicants or entrymen who are in arrears for more than one calendar year for the payment of any charge for operation and maintenance, or any construction charges and penalties, notwithstanding the provisions of section 6 of the Act of August 13, 1914 (38 Stat., p. 686): *Provided,* That nothing herein shall be construed to relieve any beneficiary hereunder from payments due or penalties thereon required by said act.

Payment by Government of Interest on Condemnation Award.

An award in condemnation proceedings, which were instituted by the United States to appropriate for reclamation purposes lands already actually taken, properly included interest at 6 per cent from the time of the actual taking to the time of the deposit of the awards in court in payment of the same, especially where such allowance of interest is in harmony with the policy of the State wherein the lands are situated. (United States v. Rogers, 65 L. ed., 353, affirming 257 Fed., 397).

Bills Introduced in Congress.

IN THE HOUSE.

H. J. Res. 57.—"Joint resolution making the provisions of section 2296 of the United States Revised Statutes applicable to all entries made under the homestead laws and laws supplemental and amendatory thereof," introduced April 18, 1921, by Representative John E. Raker, of California.

H. J. Res. 64.—"Joint resolution to appropriate out of the funds of the Blackfeet Tribe of Indians the sum of \$10,000, or so much thereof as may be necessary, to bring test suits in the United States court, district of Montana, to determine the right of the Government to issue patents in fee to members of the Blackfeet Tribe, and for other purposes," introduced April 20, 1921, by Representative Carl W. Rickdick, of Montana.

H. R. 2199.—"A bill giving applicants under the stock-raising homestead law whose applications may be rejected a preference right to enter lands under other provisions of the homestead law," introduced April 11, 1921, by Representative Frank W. Mondell, of Wyoming.

H. R. 3726.—"A bill to encourage the development of the agricultural resources of the United States through Federal and State cooperation, giving preference in the matter of employment and the establishment of rural homes to those who have served with the military and naval forces of the United States," introduced April 15, 1921, by Representative William B. Bankhead, of Alabama.

H. R. 3728.—"A bill to increase, without expenditure of Federal funds, the opportunities of the people to reclaim and acquire rural homes, and for other purposes," introduced April 15, 1921, by Representative Moses P. Kinkaid, of Nebraska.

H. R. 4128.—"A bill restoring homestead rights to officers, soldiers, sailors, and marines who served in the United States Army or Navy during the war with Germany," introduced April 18, 1921, by Representative Nicholas J. Sinnott, of Oregon.

H. R. 4382.—"A bill to provide for the application of the reclamation law to irrigation districts," introduced April 19, 1921, by Representative John E. Raker, of California.

H. R. 4384.—"A bill to encourage the reclamation of certain arid lands in the States of California and Idaho, and for other purposes," introduced April 19, 1921, by Representative John E. Raker, of California.

H. R. 4596.—"A bill to provide for the disposal of certain waste and drainage water from the Rio Grande project, New Mexico-Texas," introduced April 20, 1921, by Representative C. B. Hudspeth, of Texas.

H. R. 4895.—"A bill to provide employment for returned soldiers, to open up the unused lands and natural resources of the United States for the use of returned soldiers and other citizens who may desire access to them, and to promote the general welfare of all the people of the United States, and to establish an executive department of the United States to be known as the department of land and natural resources," introduced April 22, 1921, by Representative George Huddleston, of Alabama.

H. R. 4897.—"A bill for the relief of certain ex-service men whose rights to make entries on the North Platte irrigation project, Nebraska-Wyoming, were defeated by intervening claims," introduced April 22, 1921, by Representative Frank W. Mondell, of Wyoming.

H. R. 4993.—"A bill providing for cooperation between the United States and State Governments in the rural settlements of soldiers, sailors, and marines, and to promote the reclamation of lands, and for other purposes," introduced April 25, 1921, by Representative John E. Raker, of California.

H. R. 5008.—"A bill to encourage the reclamation of certain arid lands in the State of Idaho, and for other purposes," introduced April 25, 1921, by Representative Addison T. Smith, of Idaho.

H. R. 5009.—"A bill to amend section 3 of an act entitled 'An act to provide for stock-raising homesteads, and for other purposes,' " introduced April 25, 1921, by Representative Edward T. Taylor, of Colorado.

H. R. 5036.—"A bill to exempt from cancellation certain desert-land entries in Imperial County, Calif.," introduced April 25, 1921, by Representative Phil D. Swing, of California.

H. R. 5223.—"A bill to exempt from cancellation certain desert-land entries in Riverside County, Calif.," introduced April 26, 1921, by Representative Phil D. Swing, of California.

H. R. 5354.—"A bill to provide soldiers, sailors, and marines with capital for agricultural development, and for other purposes," introduced April 27, 1921, by Representative Wilson.

H. R. 6048.—"A bill to encourage the development of the agricultural resources of the United States and the establishment of rural homes through Federal and State cooperation, giving preference in the matter of employment and the establishment of such homes to those who have served with the military and naval forces of the United States," introduced May 10, 1921, by Representative William B. Bankhead, of Alabama.

IN THE SENATE.

S. J. Res. 49.—"Joint resolution giving to veterans of the War with Spain and the Philippine insurrection the same preferred right of homestead entry granted veterans of the War with Germany," introduced May 4, 1921, by Senator Charles L. McNary, of Oregon.

S. 274.—"A bill for the erection and maintenance of a dam across the Yellowstone River, in the State of Montana," introduced April 12, 1921, by Senator Thomas J. Walsh, of Montana.

S. 447.—"A bill providing for the leasing of arid lands which are irrigable, belonging to Indian allottees, and fixing the maximum time for which such leases may run," introduced April 12, 1921, by Senator Reed Smoot, of Utah.

S. 551.—"A bill to establish a branch of the Interior Department in the Western States, and to transfer to such branch certain bureaus and offices of the Interior Department," introduced April 12, 1921, by Senator Pat Harrison, of Mississippi (for Senator William H. King, of Utah).

S. 580.—"A bill to allow credit for husbands' military service in case of homestead entries by widows, and for other purposes," introduced April 13, 1921, by Senator Thomas Sterling, of South Dakota.

S. 732.—"A bill to extend the provisions of section 2455, Revised Statutes, to the lands within the abandoned Fort Buford Military Reservation in the States of North Dakota and Montana, introduced April 13, 1921, by Senator Henry L. Myers, of Montana.

S. 733.—"A bill to amend an act approved June 22, 1910, entitled, 'An act to provide for agricultural entries on coal lands,' introduced April 13, 1921, by Senator Henry L. Myers, of Montana.

S. 734.—"A bill to provide for the payment for certain lands within the former Flathead Indian Reservation, in the State of Montana," introduced April 13, 1921, by Senator Henry L. Myers, of Montana.

S. 735.—"A bill providing for enlarged homesteads in forest reserves and for additional homesteads," introduced April 13, 1921, by Senator Henry L. Myers, of Montana.

S. 736.—"A bill giving the right to an additional homestead to all persons who have exhausted or who shall exhaust their original right of entry through the purchase of Indian lands," introduced April 13, 1921, by Senator Henry L. Myers, of Montana.

S. 738.—"A bill authorizing any land-grant railroad company, or its successors, to convey for public-road purposes certain parts of its right of way," introduced April 13, 1921, by Senator Henry L. Myers, of Montana.

S. 739.—"A bill authorizing the Secretary of the Interior to sell and convey to the Great Northern Railway Co. certain lands for stock yards, and for other purposes, at Browning Station, in the State of Montana," introduced April 13, 1921, by Senator Henry L. Myers, of Montana.

S. 797.—"A bill to encourage home ownership and to stimulate the buying and building of homes, to create a standard form of investment based on building-association mortgages, to create Government depositories and financial agents for the United States, to furnish a market for Government bonds, and for other purposes," introduced April 13, 1921, by Senator William M. Calder, of New York.

S. 806.—"A bill providing for the investigation of the feasibility of reclaiming by irrigation certain lands in the State of Idaho for agricultural purposes," introduced April 13, 1921, by Senator Frank R. Gooding, of Idaho.

S. 809.—"A bill to give preference right of employment on construction work on United States reclamation projects, and preference right of entry on the public lands, to honorably discharged soldiers, sailors, and marines," introduced April 13, 1921, by Senator Frank R. Gooding, of Idaho.

S. 888.—"A bill authorizing the Strawberry Valley High Line Canal Co. to purchase the West Mountain lands," introduced April 18, 1921, by Senator Reed Smoot, of Utah.

S. 889.—"A bill further to assure title to lands granted the several States, in place, in aid of public schools," introduced April 18, 1921, by Senator Reed Smoot, of Utah.

S. 915.—"A bill to extend the rights of stock-raising homesteaders," introduced April 18, 1921, by Senator A. A. Jones, of New Mexico.

S. 1099.—"A bill to amend section 2372 of the Revised Statutes," introduced April 25, 1921, by Senator A. A. Jones, of New Mexico.

S. 1110.—"A bill validating and confirming conveyances of lands made by allottees on the Yakima Indian Reservation, in the State of Washington, introduced April 25, 1921, by Senator Wesley L. Jones, of Washington.

S. 1137.—"A bill for the relief of W. H. Presleigh," introduced April 25, 1921, by Senator Wesley L. Jones, of Washington.

S. 1250.—"A bill for the relief of purchasers of Indian lands and water rights on the diminished or

ceded Shoshone or Wind River Reservation, Wyo., and for other purposes," introduced April 27, 1921, by Senator John B. Kendrick, of Wyoming.

S. 1251.—"A bill providing for investigations for irrigation works in Green River, Wyo.," introduced April 27, 1921, by Senator John B. Kendrick, of Wyoming.

S. 1307.—"A bill granting homesteads to soldiers, sailors, and marines upon proof of 90 days' residence," introduced April 28, 1921, by Senator Holm Bursum, of New Mexico.

S. 1356.—"A bill to encourage the development of the agricultural resources of the United States through Federal and State cooperation, giving preference in the matter of employment and the establishment of rural homes to those who have served with the military and naval forces of the United States," introduced April 28, 1921, by Senator Duncan U. Fletcher, of Florida.

S. 1609.—"A bill providing for the survey and reclamation of arid, swamp, and logged-off lands within the continental limits of the United States, and the sale of same upon a system of deferred payments to soldiers and other citizens," introduced May 4, 1921, by Senator Miles Poindexter, of Washington.

S. 1620.—"A bill granting the State of Colorado 2,000,000 acres of public land to aid in the maintenance of a system of public roads," introduced May 4, 1921, by Senator L. C. Phipps, of Colorado.

S. 1649.—"A bill to provide for the disposal of certain waste and drainage water from the Rio Grande project, New Mexico-Texas," introduced May 7, 1921, by Senator Morris Sheppard, of Texas.

S. 1728.—"A bill extending the time for payment of construction charges on reclamation projects for one year, and for other purposes," introduced May 12, 1921, by Senator William E. Borah, of Idaho.

S. 1729.—"A bill amending the Federal farm loan act relative to liens and encumbrances, and for other purposes," introduced May 12, 1921, by Senator William E. Borah, of Idaho.

S. 1766.—"A bill to amend an act entitled 'An act for the relief of homestead entrymen or settlers who enter the military or naval service of the United States in time of war,' introduced May 12, 1921, by Senator Henry L. Myers, of Montana.

—Ottamar Hamele.

LUCIEN H. THADEN RESIGNS.

Lucien H. Thaden, draftsman in the Washington office, resigned at the close of April 30, 1921, to engage in the automobile business. Mr. Thaden was connected with the Service nearly 17 years, serving in the Washington and Denver offices. He goes into his new enterprise with the best wishes of the Service.

Are farmers wasteful? It seems so, for according to authoritative figures one-half of their most valuable crop—the manure crop—is wasted each year. The loss amounts to \$500,000,000 a year—one-fourth enough to float the first Liberty loan. With proper storage of the crop in covered concrete pits, or in sheds, the loss need not exceed one-third that amount.

ENGINEERING INVESTIGATIONS.

Probable Recurrence of Extreme Drought Conditions in Sacramento Valley, Calif.

By E. T. Eriksen, Engineer, U. S. R. S.

IN connection with the extreme drouth conditions that prevailed in the interior valley of California during the four years 1916 to 1920, some results of a study of the precipitation in the Sacramento Valley during the entire period covered by available records may be of interest.

This drouth was most serious in curtailing the water supply for irrigation and other uses. Confidence was disturbed more or less, especially among settlers of irrigation projects, as to the reliability of their water supply and the future of irrigation in the valley. There has been some consideration of plans to provide additional supplies should similar conditions again prevail. Investigation along this line, however, seems to indicate that the extreme conditions were unprecedented in the period for which rainfall records have been kept.

The period covered by records of a considerable number of U. S. Weather Bureau stations scattered over the State is about 50 years. The records of the Sacramento station cover 72 years and those of Nevada City 58 years. To avoid dividing the storage season, the seasonal rainfall, July 1 to June 30, as given in the Weather Bureau Summary, was used instead of the annual rainfall in obtaining the results shown below.

Records of 10 stations in the valley and 10 stations in the mountain region of the Sacramento Basin were studied. The average rainfall for the 10 valley stations for each year was computed and the figures platted in the diagram, the composite of the 10 stations being shown in figure 1.

The 10 valley stations, with elevation, seasonal normal rainfall in 1916, and record period of each are as follows:

Station.	Elevation.	Seasonal normal rainfall.	Number of years covered by records.
		<i>Inches.</i>	
Colusa.....	60	16.60	50
Willows.....	136	17.14	43
Davis.....	51	17.40	50
Orland.....	254	18.63	38
Sacramento.....	71	19.32	72
Marysville.....	67	19.94	50
Rocklin.....	249	22.58	50
Chico.....	189	23.84	50
Folsom City.....	252	24.82	50
Red Bluff.....	307	25.23	44
Average seasonal normal.....		20.55	

The results shown in figure 1 are considered valuable as showing the average precipitation in the Sacramento Valley during the period covered by records.

Inspection of the diagram shows that in the 50 years since 1870 the recent drouth was the only one that continued for four years, and that only one other period of drouth or less than normal rainfall, 1886 to 1889, continued as long as three years. The composite figures show a shortage of rainfall amounting to 28.6 per cent in the four years 1916 to 1920, and to 26.1 per cent in the three years 1886 to 1889.

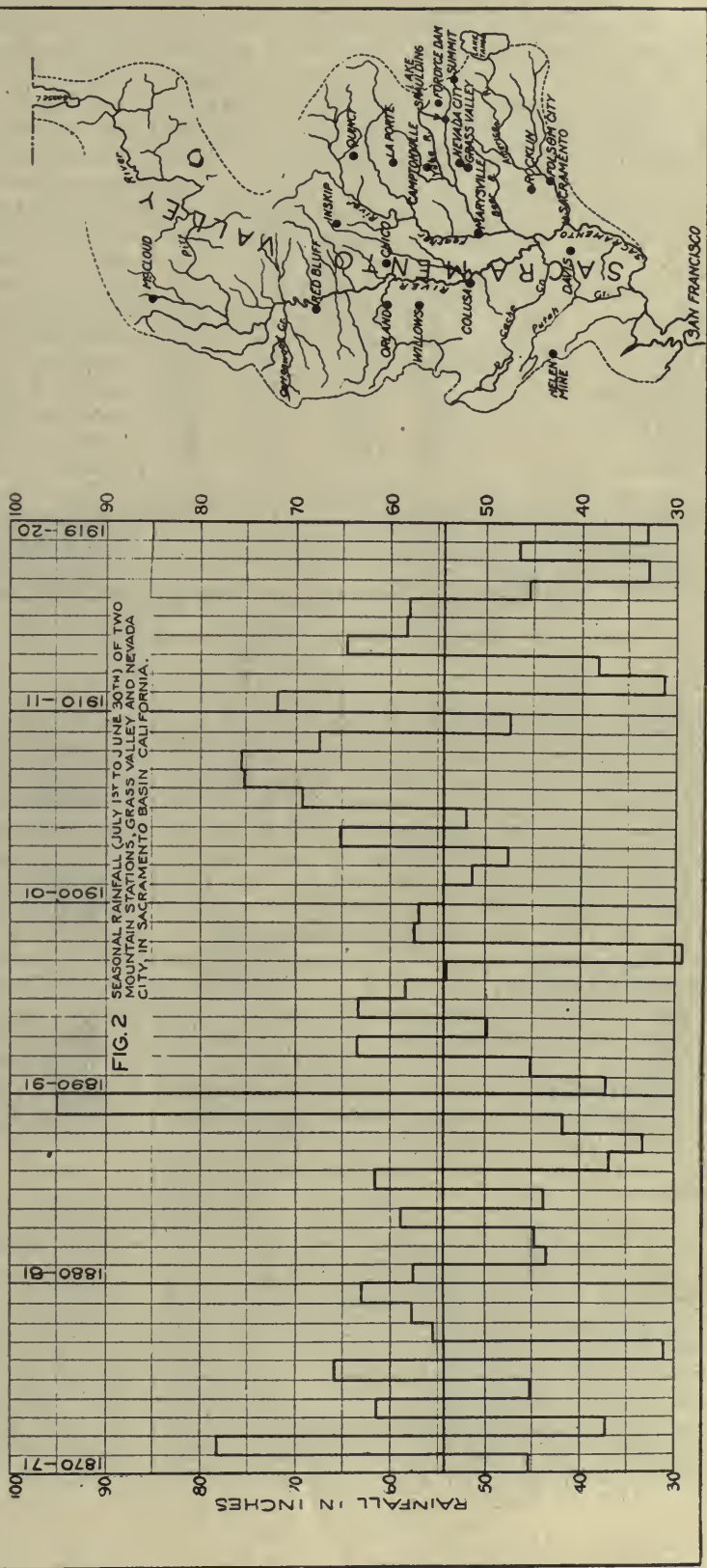
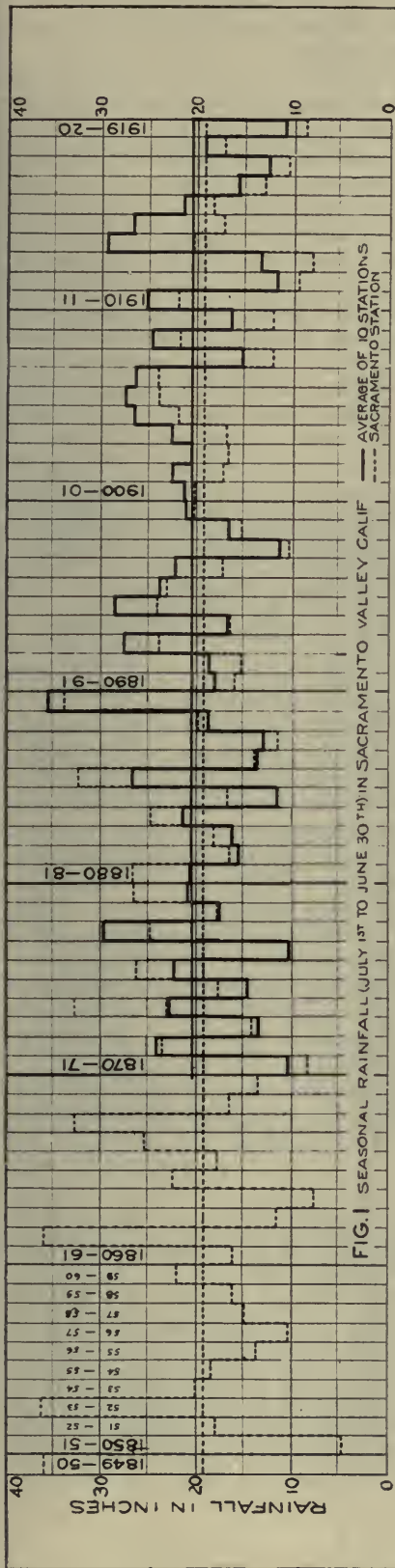
The rainfall at the Sacramento station, taken by itself, indicated in figure 1 by the dotted line, shows a four-year drouth period, 1855 to 1859, with a shortage of 28.5 per cent. However, the shortage, 1916 to 1920, at this station alone was 35.7 per cent, and it will also be noted that the rainfall was really below the normal for six years in the recent period (with a shortage of 26.5 per cent) and five years with a shortage of 23.5 per cent in the "fifties."

Thus in duration and in shortage of precipitation the recent drouth was the most severe on record. The lengthening of the dry period was obviously most serious to vegetation because of the maximum lowering of the ground water. The small rainfall of the last season of the drouth, shown on the diagram as the lowest in 44 years, accentuated the damaging results. The resulting decline in springs and stream flow produced the lowest recorded stage of the Sacramento River and the maximum shortage in supplies for irrigation and other purposes. The small river flow, coupled with large diversions for irrigation of rice, brought about the low stage at Antioch that is alleged to have produced the upstream flow of salt water to the intake for the supply of that city and led to a court proceeding involving in principle all the water rights in the Sacramento Basin.

Records for the mountain stations, where the heavy precipitation occurs and storage supplies are accumulated, reveal results similar to those of valley stations. Figure 2 is the diagram of the averages of two mountain stations, Nevada City and Grass Valley. The "ups and downs" correspond usually with those of figure 1, or the valley stations, but showing, of course, larger amounts and greater variations of precipitation.

Computations were made, however, from records of 10 mountain stations in the Sierra Nevada range in the Sacramento Basin. In the Coast Range only one station in this basin, Helen Mine, has records covering the period in question. The results are shown in the table on page 276.

As a check, the average seasonal rainfall from 1916 to 1920 for the Sierra Nevada stations was also computed and the shortage as compared with average nor-



mal, 64.06 inches, was found to be 29.9 per cent. or a shortage of practically 30 per cent, as an average, in the actual precipitation producing storage supplies and summer flow, with 33.4 per cent shown at the single station in the Coast Range. No other period of less than normal precipitation having as long dura-

tion or as great a shortage is shown by these records for the mountain stations.

From the foregoing it would be concluded that there is small probability of the recurrence of the extreme drouth in the near future. As the conditions were not equaled and only approximated in 60 years, they are not to be expected for many years to come. It may be reckoned as a certainty that they will not occur often. This phase of the matter should be considered in plans for additional water supply and in litigation concerning water rights, etc. Confidence in the future success of irrigation farming should be unshaken. While this is true, yet, owing to the uncertainty and variableness of weather conditions, there remains the possibility of serious drouth, causing water shortage with accompanying damage of agriculture and other interests in future years and the impossibility of knowing when it will occur. This menace should make for greater care in avoiding waste, conserving storage, and the saving of hold overs.

Station.	Eleva- tion.	Seasonal normal rainfall.	Number of years covered by records.	Short- age.
		<i>Inches.</i>		<i>Per cent.</i>
Summit.....	7,017	47.22	50	23.3
Fordyce Dam.....	6,500	71.22	26	24.4
La Porte.....	5,000	82.58	26	40.3
Inskip.....	4,975	84.84	14	24.6
Lake Spaulding.....	4,600	72.91	26	25.8
Camptonville.....	3,500	74.61	14	32.6
Quincy.....	3,400	44.01	25	30.8
McCloud.....	3,270	54.36	11	41.2
Nevada City.....	2,580	55.05	58	32.5
Grass Valley.....	2,090	53.82	48	22.4
Averages.....		64.06		29.8
Helen Mine.....	2,750	88.34	21	33.4

Easy Method of Determining Discharge Over Weir Having Velocity of Approach.

By W. G. Steward, Assistant Engineer, and E. H. Coffin, Instrumentman, U. S. R. S.

IN the delivery of water on irrigation projects it frequently happens that the weir pools become more or less filled with sand, silt, moss, and weeds, thus causing the water to run through a narrow shallow channel to the point where it passes over the weir. Instead of being "stilled," the water approaches the weir crest with considerable speed, and unless a correction is introduced for this "velocity of approach" erroneous measurements will result from a reading of the gauge commonly nailed on the side of the structure. In this article the only distinction between the terms "gauge" and "scale" is that the gauge is permanently fastened to the weir heading or other structure and the scale is detached so it may be used at any point above the weir crest as desired.

From experiments conducted on the Boise project, Idaho, during the season of 1919, to find an easy method by which ditch riders could determine closely the flow over such weirs, it was found by use of the ordinary enameled weir scale that this could be done in the following way:

Place the scale on and near the center of the crest of the weir in a perpendicular position, with the thin edge cutting the water, then suddenly turn the broad side against the flow of water, and note the height to which the water rises on the scale. The discharge given by the weir table for this height will be found to be very nearly accurate.

In this determination many experiments were made on typical weirs having "velocity of approach," and in each case the scale gave a higher reading than the

gauge as nailed on the side of the structure with 0.00 on the same elevation as the weir crest.

If, however, the discharge was held the same, and the "weir pool" thoroughly cleaned so as to give good conditions, both the gauge and the scale as held on the center of the crest would read alike; and these readings would correspond almost exactly with the readings of the scale on the crest when there was "velocity of approach."

Figures 1, 2, 3, and 4 show a set of these experiments. Figure 1 shows a weir on which the gauge is set to one side of the weir pool, which to a considerable extent had been filled with sediment. This gauge read 0.19 foot, whereas a scale set on the middle of the crest and turned against the stream read 0.22 foot, or a difference of 0.03 foot.

Figure 2 shows the same weir pool with the crest raised 0.65 foot so as to give good conditions of discharge. Under these conditions with identically the same head as in figure 1 both gauge and scale read 0.21 foot.

Figure 3 shows the same weir pool under the same conditions as in figure 1, but with a larger head turned in from the canal above.

In this case the "velocity of approach" was excessive and the wave action in the pool was too great to give close readings. The gauge fluctuated between 0.40 foot and 0.50 foot, and readings on the scale between 0.70 foot and 0.90 foot. This shows that it is not practical to secure good readings when there is too high a velocity of approach caused by a jet. Without changing the discharge the crest of the weir was

raised 0.65 foot and readings made as shown in figure 4, under which condition the gauge read 0.70 foot and the scale 0.69 foot.

Another experiment, as shown by figures 5 and 6, was as follows: Scale and gauge readings were made on a weir in which the pool had become badly silted, thus causing considerable "velocity of approach," as shown in figure 5. Under these conditions the gauge read 0.35 foot and the scale 0.38 foot. Without changing the amount of water flowing over the weir the pool was thoroughly cleaned. As expected, both

Many experiments were conducted along this line and all gave the same results. With this information at hand, it was decided to furnish all ditch riders on the project with the regular enameled metallic scale to correspond with the gauge as nailed on the weirs. They were given careful instructions as to

their use in case of questionable weirs, with the result that many of their troubles in the measurement of water were obviated.

In using this method it is essential that the scale should have considerable width, as the results depend upon the theory that the "velocity of head" over the weir is changed to the "static head," which is measured as the water rises against the face of the scale. The scales used were about 0.2 foot wide.

Since these experiments were conducted it has been suggested by Consulting Engineer D. C. Henny that a scale with a concave face on the side of the graduations might be used with somewhat more nearly accurate results. The experiments are so simple in their nature that they can be duplicated very easily by anyone in close touch with the operating department of any of the projects.



Determining discharge over weir having velocity of approach.

SUMMARY OF ACCOMPLISHMENT BY THE RECLAMATION SERVICE.

A summation of the work of the Reclamation Service to December 31, 1920, shows that the projects now under way or completed, including Indian projects under construction and operation by the Service, embrace approximately 3,200,000 acres of irrigable land divided into about 67,500 farms of from 10 to 160 acres. Water is available from Government canals for 1,981,370 acres on more than 42,000 farms, and the Government is under contract to supply water on 1,780,000 acres. The available reservoir capacity at that time was approximately 9,575,000 acre-feet.

The Service has dug 12,820 miles of canals, ditches, and drains, and excavated 95 tunnels with an aggregate length of more than 27 miles. It has erected masonry, earth, rock-fill and crib storage, and diversion dams with a total volume of 13,979,918 cubic yards. It has built 7,368 bridges with a total length of over 32 miles. There are now in operation 524 miles of pipe line and 129 miles of flumes.

The Service has built 986 miles of wagon road, 83 miles of railroad, 3,224 miles of telephone lines, 672 miles of transmission lines, and 1,464 buildings, such as power houses, pumping stations, offices, residences, barns, and storehouses. The power developed amounts to approximately 60,000 horsepower. The excavations of rock and earth amount to 183,307,015 cubic yards. The Government has used 3,033,815 barrels of cement, and has manufactured 1,723,822 barrels of cement and sand cement.

RECLAMATION ABROAD.

Irrigation Project at Foochow, China.

The Farm Improvement & Irrigation Co. has been organized at Foochow, with a capital of \$300,000 Mexican (\$177,000 United States currency). It is planned to irrigate about 3,000 acres of rice paddy fields, and pumping machinery costing about \$10,000 Mexican has been ordered from an American company. Electricity is to be used to operate the pumps. Fields will be irrigated by the company upon the payment of a charge of \$6 Mexican per acre per year.—*Commerce Reports.*

Reclamation Project in the State of Rio de Janeiro, Brazil.

The Empresa de Melhoramentos da Baixada Fluminense (Improvement Co. for Rio de Janeiro Low Lands) has been formed for the purpose of executing a contract which includes, among other work, the reclamation of vast stretches of land to the north of

Rio de Janeiro. The company is to have a capital of 10,000,000 milreis, public subscription to this amount having been opened at the Portuguese Bank of Brazil on March 9, 1921.—*Commerce Reports.*

Bond Issue for Irrigation Works in Chile.

The Director General of Accounts has been authorized by a presidential decree to issue 5,000,000 pesos in bonds to be devoted to irrigation works.—*Commerce Reports.*

BULLETINS FOR THE FARMER.

Distributed by the Department of Agriculture, Washington, D. C.

FARMERS' BULLETINS.

- No.
1187. Cotton diseases and their control.
1196. Standard containers for fruits and vegetables.

DEPARTMENT CIRCULARS.

152. Organization and results of boys' and girls' club work.
169. Annual white sweet clover and strains of the biennial form.

Distributed by State Experiment Stations.

UTAH BULLETINS, LOGAN, UTAH.

- No.
176. Potato improvement by hill selection.
177. Some types of irrigation farming in Utah.

CIRCULAR.

43. Feeding work horses.

DELIVERY OF WATER TO SALT RIVER PROJECT.

Following a conference with President F. A. Reid and Frank A. Stewart, representatives of the Salt River Valley Water Users' Association, Secretary Fall gave instructions on May 18, 1921, that the association, as agents of the United States, would be permitted to continue the delivery of water to individual users during the season of 1921, notwithstanding that they are in arrears in their payments for operation and maintenance or construction and penalties for more than one calendar year. The payments now due and to become due hereafter will remain a charge upon the property as well as the penalties accrued and to accrue under the law and the terms of the contract.

COMMERCIAL ORGANIZATIONS ON UNITED STATES RECLAMATION SERVICE PROJECTS.

Project.	Name of organization.	President.	Secretary.	Number of members.	Publications.
Salt River	Chamber of Commerce, Phoenix, Ariz.	R. D. Roper	Harry Welch	450	Yes.
Do.	Board of Trade, Higley, Ariz.	L. J. Loveless	C. B. Gardner		
Do.	Chamber of Commerce, Chandler, Ariz.	Arthur E. Price	W. W. Pickrell	100	
Do.	Commercial Club, Gilbert, Ariz.	Geo. Peterson	Ed. Crosby		
Do.	Commercial Club, Glendale, Ariz.	E. E. Jack	L. E. Kingman	100	
Do.	Commercial Club, Mesa, Ariz.	W. R. Stewart	D. F. Collett	175	
Do.	Chamber of Commerce, Peoria, Ariz.	C. A. Robertson	John Meyer		
Do.	Community Club, Tempe, Ariz.	P. Aepli			
Do.	Chamber of Commerce, Wickenburg, Ariz.	A. R. Volk	R. K. Baxter		
Yuma	Yuma County Commercial Club, Yuma, Ariz.	J. H. Westover	L. W. Alexander	150	Yes.
Orland	Chamber of Commerce, Orland, Calif.	J. J. Flaherty	Geo. E. Nygaard		Yes.
Grand Valley	Chamber of Commerce, Grand Junction, Colo.	L. W. Burgess	W. P. Ela	200	Yes.
Do.	Chamber of Commerce, Palisade, Colo.	F. L. Huber	C. G. Kendeligh	150	No.
Uncompahgre	Chamber of Commerce, Delta, Colo.	A. D. Fairbanks	Percy Houts	89	Yes.
Do.	Chamber of Commerce, Montrose, Colo.	C. A. W. Gordon	E. E. Schuyler	180	Yes.
Boise	Chamber of Commerce, Boise, Idaho.	E. A. Crooks	W. H. P. Hill	1,800	Yes.
Do.	Chamber of Commerce, Nampa, Idaho.	J. C. Sewell	H. W. L. Niemeyer	624	Yes.
Do.	Commercial Club, Caldwell, Idaho.	W. H. Blunt	R. W. Erwin	269	Yes.
Do.	Business Men's Association, Wilder, Idaho.	J. S. McCune	Thomas Daugherty	33	No.
King Hill	King Hill Fruit Growers' Association, King Hill, Idaho.	A. B. Montgomery	R. W. Montgomery	20	
Minidoka	Commercial Club, Burley, Idaho.	B. O. McCulloch	R. J. Burke	229	Yes.
Do.	Rotary Club, Burley, Idaho.	S. Grover Rich	R. W. Watt	25	
Do.	Chamber of Commerce, Rupert, Idaho.	J. C. Lundy	M. C. Betty	150	
Do.	Snake River Valley Community Club, Paul, Idaho.	W. C. Larsen	D. H. Banks	25	
Do.	Chamber of Commerce, American Falls, Idaho.	C. F. Schiltz	R. Roberts	100	Yes.
Huntley	No organizations				
Milk River	Commercial Club, Chinook, Mont.	F. M. Burkes	C. R. Hauke	93	No.
Do.	Chamber of Commerce and Agriculture, Glasgow, Mont.	Carl Ackerman	L. E. Jones	181	Yes.
Do.	Rotary Club, Havre, Mont.	Arthur Lamey	James Holland	32	No.
Do.	Havre Development Association, Havre, Mont.	H. Earl Clack	W. B. Pyper	200	No.
Do.	Commercial Club, Hinsdale, Mont.	F. B. Gillette	N. A. Webster	31	No.
Do.	Harlem Development Association, Harlem, Mont.	R. V. Bottomley	Robt. W. Baird	75	Yes.
Do.	Farmers and Merchants Club, Kremlin, Mont.	F. B. Purdy	Arthur Fredrickson	40	No.
Do.	Commercial Club, Malta, Mont.	G. F. Thompson	T. J. Larson	48	Yes.
Do.	Commercial Club, Nashua, Mont.	A. Torkelson	P. O. Edman		No.
Do.	Commercial Club, Saco, Mont.	Wm. H. Frazier		30	No.
Sun River	Commercial Club, Great Falls, Mont.	W. A. Bertke	Scott Leavitt		Yes.
Do.	Commercial Club, Fairfield, Mont.	O. E. Holmberg	L. A. McCaffery		
Do.	Commercial Club, Simms, Mont.	E. R. Kahla			
Do.	Commercial Club, Gilman, Mont.	F. M. Mack			
Lower Yellowstone	Chamber of Commerce, Sidney, Mont.	A. Vaux	R. P. Innes	100	
North Platte	Chamber of Commerce, Torrington, Wyo.	Dr. C. H. Platz	D. T. Shoemaker	75	Yes.
Do.	Commercial Club, Gering, Nebr.	A. D. Baker	Jesse Entrefek	60	Yes.
Do.	Commercial Club, Melbeta, Nebr.	W. H. Hodge	John T. Swan	20	No.
Do.	Chamber of Commerce, Scottsbluff, Nebr.	H. P. Johnson	H. S. Stark	300	Yes.
Do.	Community Club, Mitchell, Nebr.		O. P. Burrows	150	No.
Do.	Commercial Club, Morrill, Nebr.	F. E. Stearns	J. A. Galusha		No.
Do.	Chamber of Commerce, Bridgeport, Nebr.	F. E. Williams	A. E. Fisher	60	No.
Do.	Chamber of Commerce, Bayard, Nebr.	E. E. Richards	E. E. Boggan		No.
Do.	Commercial Club, Minatare, Nebr.	L. L. Conklin	Erick Klemke		No.
Newlands	Churchill County Commercial Club, Fallon, Nev.	H. A. Clark	W. K. Davis	275	
Carlsbad	Commercial Club, Carlsbad, N. Mex.	F. E. Hubert	W. F. McVain		
Do.	Eddy County Farm Bureau, Carlsbad, N. Mex.	W. W. Galton	Mrs. Geo. O'Connor		
Rio Grande	Chamber of Commerce, El Paso, Tex.	C. N. Bassett	D. A. Bandeen	3,200	Yes.
Do.	Dona Ana County Farm Bureau, Las Cruces, N. Mex.	A. S. J. Elyar	S. S. Hookland	831	Yes.
Do.	Commercial Club, Las Cruces, N. Mex.	Dr. F. F. Wilcox	W. H. Broadus	30	
Do.	Chamber of Commerce, Hot Springs, N. Mex.	Robert Martin	H. D. Hill	40	
North Dakota pumping	Commercial Club, Williston, N. Dak.	J. B. Lyon	Henry F. Dooley		
Do.	Farmers Creamery and Produce Co., Williston, N. Dak.	John Bruegger	H. C. Blankenship		
Do.	Missouri Yellowstone Pure Breeders' Association, Williston, N. Dak.	U. L. Burdick	A. L. Burke		
Umatilla	Commercial Club, Umatilla, Oreg.	O. Stangeby	H. R. Benjamin		No.
Do.	Commercial Club, Hernistown, Oreg.	E. P. Dodd	F. V. Prime	30	No.
Do.	Commercial Club, Boardman, Oreg.	A. W. Cobb	M. B. Signs	25	No.
Klamath	Klamath County Chamber of Commerce, Klamath Falls, Oreg.	E. B. Hall	T. L. Stanley	607	Yes.
Belle Fourche	Commercial Club, Newell, S. Dak.	L. D. Rosebro	E. S. Hartwell	90	Yes.
Do.	Commercial Club, Nisland, S. Dak.	Jacob Snyder	L. G. Tomlinson	43	
Do.	Commercial Club, Fruitdale, S. Dak.	M. B. Stearns	D. L. Roberts		
Do.	Commercial Club, Belle Fourche, S. Dak.	H. O. Alexander			
Strawberry Valley	Commercial Club, Spanish Fork, Utah	Neal Dahle	W. C. Adams	60	No.
Do.	Commercial Club, Springville, Utah	J. E. Bird	Len E. Wiscombe	100	No.
Do.	Commercial Club, Payson, Utah	L. N. Ellsworth	J. R. Vance	30	No.
Okanogan	Commercial Club, Okanogan, Wash.	Chas. A. Johnson	Geo. B. Parks	150	Yes.
Yakima	Commercial Club, Yakima, Wash.	F. A. Duncan	O. C. Loots	1,400	Yes.
Do.	Commercial Club, Sunnyside, Wash.	O. L. Boose	F. Arrowsmith	170	No.
Do.	Commercial Club, Prosser, Wash.	E. R. Wells	Chas. E. Dyke	90	No.
Do.	District Club, Grandview, Wash.	J. B. Anderson	Wm. L. Waters	200	No.
Do.	Community Club, Zillah, Wash.	J. B. Draper	R. O. Kylan	60	
Do.	Naches Heights Commercial Association, route 6, Yakima, Wash.	Wm. McKinney	Mrs. Geo. Dash	75	
Riverton	Commercial Club, Riverton, Wyo.	J. A. Delfelder	E. T. Glenn	75	No.
Do.	Commercial Club, Shoshone, Wyo.	L. A. Shawver	A. O. Heyer	30	No.
Shoshone	Business Men's Association, Deaver, Wyo.	P. C. Vliander	M. C. Morrison	50	No.
Do.	Commercial Club, Frannie, Wyo.	Paul Weaver	John Zweimer	35	No.
Do.	Chamber of Commerce, Powell, Wyo.	W. A. Deming	G. C. Dillavou	250	No.
Do.	Cody Club, Cody, Wyo.	Ora Sonners	Ray Myers	50	No.
Blackfeet	Commercial Club, Browning, Mont.	A. F. Bartholomew	H. C. Shanklin	60	No.
Flathead	Commercial Club, Polson, Mont.	James Habert	C. H. Lyman	30	No.
Fort Peck	Commercial Club, Wolf Point, Mont.	O. C. Johnson	Arle M. Poor	100	No.
Do.	Commercial Club, Culbertson, Mont.		H. S. Myhr	50	No.
Do.	Commercial Club, Poplar, Mont.	Otto Ramstad	R. M. Conner	70	No.

The Reclamation Record.

Issued monthly by the Reclamation Service, Department of the Interior, under the authority of the Secretary of the Interior.

Copies of the RECLAMATION RECORD will be sent free of charge to any water user on our reclamation projects. The subscription price to others is 75 cents a year, payable in advance. Subscriptions may be forwarded to the chief clerk, United States Reclamation Service, Washington, D. C., and remittances (postal money order or New York draft) should be made payable to the special fiscal agent, United States Reclamation Service. Postage stamps will not be accepted.

Material for publication in the RECLAMATION RECORD should be addressed to *Editor*, United States Reclamation Service, Washington, D. C., and should be mailed in time to reach the editor not later than the 14th of the month in order to insure publication in the succeeding month's issue of the RECORD.

HUGH A. BROWN, EDITOR.

SUBSCRIPTION BLANK.

Reclamation Record.

[To be used only by persons who are NOT water users on the projects of the U. S. Reclamation Service.]

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U. S. Reclamation Service,

Washington, D. C.

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(Name.)

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(City and State.)

(Write plainly.)

NOTE.—Send money order or New York draft, made payable to Special Fiscal Agent, U. S. Reclamation Service. Do NOT send stamps.

RIO GRANDE PROJECT OFFICE EMPLOYEES.

[See page 296.]

1. J. E. Sater, bookkeeper.
2. C. F. Harvey, law clerk.
3. N. E. Fordham, master mechanic.
4. L. M. Lawson, project manager.
5. P. W. Dent, district counsel.
6. C. A. Peavey, chief clerk.
7. Howard Brown, assistant bookkeeper.
8. Geo. W. Hoadley, right-of-way agent.
9. L. R. Flock, office engineer.
10. T. W. Parry, irrigation manager.
11. R. D. Brice, purchasing agent.
12. Anne Chase, head stenographer.
13. Grace G. Minich, general clerk.
14. Margaret E. Flournoy, legal stenographer.
15. Mrs. M. T. Hammond, telephone operator.
16. Helen Fahrenkamp, assistant water-rental clerk.
17. Mrs. Novella Ford, stenographer.
18. Helen E. Noyes, voucher clerk.
19. Ruth Youart, messenger.
20. T. H. Claussen, assistant engineer.
21. Frank H. Knapp, chief hydrographer.
22. A. O. Dreyer, assistant to office engineer.
23. N. B. Phillips, storekeeper.
24. H. A. Griffin, instrumentman.
25. L. R. Smith, costkeeper.
26. M. E. Beatty, draftsman.
27. L. O. Newsome, chief of party.
28. E. F. Gunter, property clerk.
29. K. S. Beckett, jr., construction records.
30. J. H. Monahan, draftsman.
31. Albert Henderson, draftsman.
32. W. P. Herbert, draftsman.
33. L. S. Kennicott, fiscal agent.
34. T. A. Hallihan, water-rental clerk.
35. T. J. Lawrence, senior draftsman.

SOUTH AFRICAN ENGINEER TO STUDY IRRIGATION PROBLEMS.

Mr. William Godfrey Sutton, a member of the public service of the Union of South Africa, is on his way to the United States for the purpose of gaining experience for one year with the Reclamation Service with a view to utilizing his experience in furthering irrigation development in South Africa.

It will be recalled that Mr. Sutton comes to us at the request of the High Commissioner for the Union of South Africa, to whose cable former Secretary Payne made a cordial and favorable response. Mr. Sutton's expenses while with the Reclamation Service will be paid by the Union of South Africa.

The Reclamation Service welcomes this opportunity to place its 20 years of experience in irrigation at the service of its South African coworkers for the advancement of civilization.

Work and save. Buy Government securities.

MONTHLY PROGRESS REPORTS FOR APRIL, 1921.

Monthly conditions of principal Reclamation Service reservoirs for April, 1921.

[Elevation above sea level.]

State and project.	Reservoir.	Available capacity in acre-feet.	Elevation.		Storage in acre-feet.			Out-flow in acre-feet.	Elevation of water surface.		
			Spill-way crest. ¹	Lowest gate sill. ²	Beginning of month.	End of month.	Maximum.		Beginning of month.	End of month.	Maximum.
Arizona, Salt River.....	Roosevelt ³	41,305,000	2128	1903	834,126	762,950	834,126	.....	2092.51	2087.05	2092.51
California, Orland.....	East Park.....	51,000	1199.68	1111.68	50,830	51,160	51,310	3,808	1199.59	1199.78	1199.85
Idaho:											
Boise.....	Arrowrock.....	280,000	3211	2956	221,080	248,080	248,080	287,248	3190.8	3201.1	3201.1
	Deer Flat.....	177,000	2518	2488	163,282	173,734	177,000	22,332	2516.55	2517.65	2518
Minidoka.....	Lake Walcott.....	95,180	4245	4236	85,290	90,990	93,440	476,869	4244.15	4244.64	4244.85
	Jackson Lake.....	847,000	6769	6730	325,830	359,350	359,350	.....	6746.94	6748.48	6748.48
Montana:											
Milk River.....	Nelson.....	27,000	2214	2200	17,400	28,040	28,200	.....	2208.8	2212.84	2212.89
St. Mary Storage.....	Sherburne.....	33,000	4788	4720	.....	.....	.....	.....	.....	.....	.....
Sun River.....	Willow Creek.....	16,700	4130	4085	13,355	14,120	14,120	.....	4126.5	4127.3	4127.3
Nebraska-Wyoming, North Platte.....	Pathfinder.....	1,070,000	5882	5670	.....	.....	.....	.....	.....	.....	.....
	Lake Alice.....	11,400	4182	4159	.....	.....	.....	.....	.....	.....	.....
	Lake Minatare.....	60,700	4125	4074	.....	.....	.....	.....	.....	.....	.....
Nevada, Newlands.....	Lake Tahoe.....	120,000	6230	6224	.....	.....	.....	.....	6225.18	6225.35	6225.35
	Lahontan.....	290,000	4162	4060	169,160	169,240	173,080	36,862	4148.6	4149.1	4149.7
New Mexico:											
Carlsbad.....	McMillan.....	45,000	3267.7	3241.6	31,250	15,000	31,250	13,000	3265.3	3261.1	3265.3
Rio Grande.....	Elephant Butte.....	2,638,500	4407	4321.5	1,706,587	1,639,369	1,706,587	83,585	4380.4	4378.1	4380.4
Oregon, Umatilla.....	Cold Spring.....	50,000	621.5	560	49,200	47,100	49,200	6,500	620.98	619.18	620.98
Oregon-California, Klamath.....	Clear Lake.....	462,000	4540	4514	404,000	416,000	416,000	.....	4537.8	4538.2	4538.2
South Dakota, Belle Fourche.....	Belle Fourche.....	203,000	2975	2920	184,970	188,250	188,270	.....	2972.6	2973	2973
Utah, Strawberry Valley.....	Strawberry.....	250,000	7558	7517	209,740	219,040	219,040	.....	7552.4	7553.7	7553.7
Washington:											
Okanogan.....	Conconully.....	14,400	2290	2232	2,221	3,469	3,469	.....	2256	2261	2261
Yakima.....	Bumping Lake.....	34,000	3426	3389	3,820	5,270	5,820	550	3394.9	3397.1	3397.9
	Lake Clealum.....	22,800	2134	2122	26,245	26,890	28,500	1,610	2134.9	2135.2	2135.9
	Lake Kachess.....	210,000	2258	2192	165,800	191,245	191,245	.....	2245	2251.1	2251.1
	Lake Keechelus.....	152,000	2515	2425	94,545	111,960	111,960	.....	2494.2	2497.6	2497.6
Wyoming, Shoshone.....	Shoshone.....	456,600	5360	5132.3	216,642	200,459	216,647	43,699	5314.6	5310.5	5314.6

¹ Or maximum storage.² Or zero storage.³ Zero water depth at elevation 1902.2.⁴ Amount of silt shown by silt survey deducted from original capacity.⁵ Proposed regulation.⁶ Estimated low-water limit under proposed plan of regulation.

SALT RIVER PROJECT, ARIZONA.

Operation and maintenance of irrigation system.—

Water was out of the following canals for a short period for cleaning purposes: Consolidated, Eastern, Maricopa, Joint Head, and Western. The demand for irrigation water was steadily increasing.

Five maintenance crews were in the field, and the following statement shows the average number of men and stock employed and the results accomplished: Average number of men, 159.60; average number of stock, 12; miles main canals cleaned, 83.44; miles laterals cleaned, 145.50; number of new structures installed, 15; number of old structures repaired, 146; riprap placed, 3,906 linear feet; dry masonry placed, 7 cubic yards; dirt fill placed, 774 cubic yards; concrete placed, 13 cubic yards; new waste ditch constructed, 1 mile; concrete pipe laid, 24 inch, 8 feet; corrugated pipe laid, 24 inch, 664 feet.

The Ruth dredger was engaged in berming the Western Canal for a distance of 10½ miles in 18 working days, moving approximately 7,633 cubic yards of dirt.

Work was started about the 11th on the erection of pump houses for subdrainage along the Arizona and Grand Canals. Three houses were completed and the foundation put in for the fourth.

Operation of power system.—The total power generated was 4,429,150 kilowatt hours. The Roosevelt Power Plant operated continuously and generated 2,956,000 kilowatt hours. The rewinding of generator No. 4 was completed, and it was installed and placed

in service. The Cross Cut Power Plant operated continuously with an output of 754,100 kilowatt hours.

The Arizona Falls Plant operated 223 hours, generating 99,250 kilowatt hours. The South Consolidated Plant operated 716 hours, generating 412,100 kilowatt hours, and the Chandler Plant operated 714 hours, with an output of 207,700 kilowatt hours. All the substations operated without trouble. A transformer at the Phoenix Substation was replaced and torn down for repairs. The pumping plants were all available for operation as needed.

Construction work.—At Roosevelt the rewinding of generator No. 3 was about 75 per cent completed. The work necessary for moving the canal pump down to the power plant was 90 per cent completed.

At the Highline Pumping Plant the new motor for Unit No. 1 was installed. The pump rebuilt and the Unit placed in service. The new 300-kilowatt ampere transformer was installed and placed in service.

Work was resumed on the construction of the 11,000-volt power lines for pumping plants northeast of Phoenix, which was 90 per cent completed at the end of the month.

New Layne and Bowler pumps were installed during the month at the following plants: 15E-8N; 15E-8½N; 16E-SN. Switchboards and wiring were installed at the following plants during the month: 15E-8N and 15E-8½N.

Office.—A total of 189,808.20 acres were entitled to irrigation water service on the first of the month.—C. C. Cragin.

YUMA PROJECT, ARIZONA-CALIFORNIA.

Unusually cool weather prevailed during April with frosts during the early part. Some slight damage to crops was reported but it was not believed to be serious. The project manager attended the meeting of the California Railroad Commission held at Los Angeles April 28 to consider the report of the Joint Committee on Electric Service Conditions at Yuma, and an arrangement was made which may afford some slight relief to the valley.

Construction.—The Bucyrus drag line advanced 0.45 mile along the east drain, excavating 24,000 cubic yards of earth. Monighan dragline No. 2 advanced 0.60 mile on the south drain, excavating 18,000 cubic yards. The P. & H. drag line worked on connecting up ponds in the half mile of slough at the upper end of the main drain and took out 1,800 yards of earth.

Operation and maintenance.—Twenty-one thousand acre-feet of water were delivered to users. Ruth dredger No. 6, on the Indian Reservation, cleaned 4.4 miles of laterals, excavating 4,300 cubic yards of silt; in the Yuma Valley three Ruth dredges cleaned 17.5 miles of laterals, excavating 15,900 cubic yards of silt.

The maximum discharge of the Colorado River was 16,700 second-feet; minimum 10,000 second-feet. On April 30 the gage height was 17.55 with a discharge of 16,700 second-feet. The total discharge for the month was 814,000 acre-feet.

Official visitors were Messrs. H. S. Sung and T. L. Shen of Shanghai, China; L. Wehner, chief engineer of the P. & H. Co.; Drainage Engineer J. L. Burkholder; Messrs. T. Tanaka and S. Norisawa, Imperial University of Tokyo, Japan; and W. R. Parkhill, engineer-appraiser, Federal Land Bank, Berkeley, Calif.—*Porter J. Preston.*

YUMA AUXILIARY PROJECT, ARIZONA.

April weather conditions were favorable for construction work except for a few days of high wind. The crushing plant at the mesa quarry was operated continuously during the month. The rock crushed was placed on the road being built in the First Mesa Unit. Three-quarters of a mile of road was built during the month. Machinery and lumber for the erection of the concrete pipe manufacturing plant were received during the month.

Construction of the B lift pumping plant was carried on during the month, the building at the end of the month being up to elevation 131. The 36-inch centrifugal pump was received from the manufacturers during the month and delivered to the pump site. The transformers, vacuum pumps, and other miscellaneous equipment were received and delivered to the plant site. Excavation of the trench for the 72-inch concrete force main was practically completed.

The new Bucyrus dredge, class 30-B, commenced on the 1st the raising of the bank of the Yuma Project East Main Canal. During the month it completed 45 stations, moving about 20,000 cubic yards. Monighan dredge No. 1 working on the project East Main Canal, worked between Stations 270 and 279.

Office engineering was confined to routine work on construction now being carried on. Labor was plentiful.—*Porter J. Preston.*

ORLAND PROJECT, CALIFORNIA.

April weather was unfavorable with a great deal of drying wind and extremely variable temperatures,

ranging from a minimum of 32° to a maximum of 92°. Little damage resulted from frost on the project, although throughout the central valleys of the state a very heavy loss to fruit crops resulted. Rainfall for the month was 0.24 inches, about 1 inch less than the April average. Water for irrigation was run in all canals and laterals, with a delivery of 4,800 acre-feet to 8,600 acres. Three thousand eight hundred acre-feet of water passed over the East Park spillway during the month. The first cutting of alfalfa was made, yielding generally a satisfactory crop. The market for farm products was inactive and prices were low.

A preliminary organization of the Orland Federal Farm Loan Association was effected. The new board of directors of the Water Users' Association rescinded the old board's action in suspending work on concrete lining.

Teams and scraper work in cleaning laterals was completed early in the month. One team was employed in surfacing operating roads and four laborers in mowing ditch banks. Two minor structures were built and 424 linear feet of concrete pipe manufactured. Seven hundred and eighty square yards of concrete lining were placed, which completed all of the work practical to do until next October.—*A. N. Burch.*

GRAND VALLEY PROJECT, COLORADO.

April weather was colder than normal, with an excess of precipitation. Conditions were favorable for construction work as well as for farming operations. Labor was plentiful.

The preparation of land and seeding of spring crops was continued, and the majority of the project farmers had their work well in hand. The cool weather retarded the growth of alfalfa and the starting of grain and sugar beets, but these crops were coming on nicely at the end of the month. Unusually low temperatures were experienced on several nights, but comparatively little damage resulted, and the fruit crop of the valley as a whole was intact, with excellent prospects for a good yield. There was little improvement in the prices of farm products. Alfalfa hay dropped to \$9 per ton in the stack, but there was little demand, and a considerable percentage of the crop will have to be carried over.

The irrigation system was operated continuously, supplying water to all lands under the project as well as to the Palisade and Mesa County irrigation districts. No particular difficulties were encountered except with tumble weeds, which were blown into the canals and laterals in large quantities by the frequent windstorms, making it difficult to maintain uniform deliveries of water. Maintenance work consisted principally of the removal of weeds, and repairs to laterals and structures.

Drainage construction was continued with three 1-yard Monighan drag lines and one-half yard P. & H. machine. All four drag lines were working on project drains during most of the month, but one machine was returned at the end of the month to complete the work in the Grand Valley drainage district. Two and one-tenth miles of drain were completed, involving 58,000 cubic yards of excavation.—*S. O. Harper.*

UNCOMPAHGRE PROJECT, COLORADO.

April weather conditions, except for a few storms, were ideal for the completion of the usual maintenance work. The heavy freeze on the 8th seriously

injured the peach and apricot crops. The farming season was several weeks ahead of normal, and, as a result, the demand on the Gunnison Tunnel was about 80 per cent of a full head for the greater part of the month.

The P. & H. drag line completed the cleaning work necessary on the Montrose and Delta Canal between mileposts 2 and 4, and the removal of gravel from below the headworks of the same canal, and then began work on the enlargement of the Boomer feeder to the West Canal.

A heavy head of irrigating water was carried in all the project canals.

No operation difficulties were experienced except for a break at the lower end of the Dry Creek flume on the lower part of the Ironstone Canal system, due to the flood waters of Dry Creek after the storm on the 24th, which necessitated shutting water out of the canal for three days.

Work was begun on the construction of the G. H. D. C. Lateral of the East Canal system. Minor structures, including taps and measuring devices, were installed on the lateral systems as required.

Labor continued very plentiful.—*L. J. Foster.*

BOISE PROJECT, IDAHO.

April weather was unseasonable. Growth was retarded until what promised to be an early spring was set back to about normal. Light showers occurred at intervals but the precipitation was below normal.

Labor conditions.—There were a number of men both skilled and unskilled seeking employment.

Farming operations.—Seeding of small grains and early potato planting were completed. A large area was prepared for corn and some acreage for late potatoes. Irrigation of alfalfa began early in the month but owing to cool weather plant growth was slow. Range stock was moved to summer pastures. The feed is good, but dry, windy weather has dried up most of the water holes and forced the stock toward the mountain ranges. Sheep shearing was completed but there was little demand for wool.

Water supply.—The run-off from the Boise River drainage area was slightly above normal. Cool weather retarded the melting of snow in the high mountains. Reports indicate that there was still a large quantity of snow with high moisture content. Deer Flat Reservoir was filled to capacity and Arrow-rock Reservoir was only a few feet below the spillway crest.

Operation and maintenance.—Canal cleaning was completed early in the month and all canals placed in operation. The Main Canal was increased gradually and by the end of the month was nearing its capacity. Water was turned through the Notus Canal on April 20 and a small amount of water supplied to the new lands in the Notus division. Repair crews were engaged in setting taps and weirs and repairs to structures.

Construction.—The contractors on the Notus division completed the canal excavation. Government forces completed the concrete lining on the Main Canal of this division and installed a number of bridges and minor structures.

Drainage.—A 1-yard gasoline drag line was received, erected, and placed in operation on the Hughes drain in Fargo Basin. One field party was engaged in drainage surveys in the west end of the project.

Surveys.—A small amount of field work was under way during the first part of the month in the Hillcrest

division. Office studies were carried on in connection with the second division of the Black Canyon irrigation district. Minor structures were staked out and laterals run to take care of new lands in both the portion of the project under operation and the Notus division. Lines and grades were given for the construction work in progress.—*J. B. Bond.*

Prevailing crop prices at close of April, 1921.

Project.	Alfalfa hay, per ton.		Barley, per bushel.	Oats, per bushel.	Wheat, per bushel.	Potatoes, per bushel.
	In stack.	Baled at ship- ping point.				
Salt River.....	\$4-6	\$8-10				
Yuma.....	7.00	11.00				
Orland.....	8.00	12.00	\$0.50		\$1.05	
Grand Valley.....	9.00	13.00	1.25	\$0.70	1.40	\$0.75
Uncompahgre.....	5-10		1.50	.60	1.05	.70
Boise.....	5.00	9.00	.40	.50	.95	.50
King Hill.....	7.00	11.00		.64		.75
Minidoka.....	6.00	10.00	.60	.75	.75	.60
Huntley.....						
Milk River.....	7.00	9.00	.25	.56	1.03	1.20
Sun River.....	7.50	11.00	.50	.60	1.05	.50
Lower Yellowstone..	10.00		.75	.60	1.17	.60
North Platte.....						
Newlands.....	8.00	12.00				1.00
Carlsbad.....		12-18				
Rio Grande.....		18.00				
North Dakota pumping.....	15-18			.60	1.14	1.15
Umatilla.....		12.00				
Klamath.....	15.00	22.00	.60	.48	1.20	1.05
Belle Fourche.....	4-6	10.00	.84	.51	.60	1.20
Strawberry Valley..	12-14	16.00	.85	.50	1.20	1.40
Okanogan.....	20.00	24.00				1.00
Yakima:						
Sunnyside unit..	10-12	14-16				.90
Tieton unit.....	10-12	14-16				.90
Riverton.....						
Shoshone.....	5.00			.40	.75	.60
Indian projects:						
Blackfeet.....	10.00		.22	.12	1.00	
Flathead.....	10.00	15.00			1.00	
Fort Peck.....				.16	1.13	1.65

KING HILL PROJECT, IDAHO.

April weather was cold and windy, and killing frosts occurred on the 4th, 8th, and 30th. Practically all fruit was killed. Labor was plentiful.

Construction work consisted in installing a steel gate in the Gunite flume and removing forms from Greer flume. A small force was employed repairing equipment.

One survey party finished location and cross section of the Slick flume, made investigations for plant layouts and located some small laterals.

The King Hill irrigation district turned water into the main canal on the 4th. Breaks in the earth section delayed the delivery of water about a week. The maintenance force was engaged in riprapping canal banks and repairing wooden structures.—*Walter Ward.*

MINIDOKA PROJECT, IDAHO.

April weather was generally cold and wet, so that farm work was considerably delayed. The precipitation was 2.19 inches, which exceeds that for any other April on the local record.

On account of the cold, rainy weather the pumping stations were not started until the 27th, when one

pump in each station was put in operation. The discharge at No. 1 Station was 110 second-feet. By the end of the month the water was distributed over the entire project.

Minor structure work was continued, and included 120 linear feet of concrete lining of the H17 lateral, besides a number of small concrete structures. Some 50 cubic yards of concrete and 1,360 square yards of brush riprap were placed.

Surveys for the Milner transmission line were completed, all poles for the line were hauled out, and more than half of them set. A site for the substation for this line was obtained in Burley. The three 667 kilovolt ampere transformers were received and hauled to the site, as were the switches and other equipment.

Good progress was made in the enlargement of the substation at Burley. The brickwork was completed, electric conduits placed, and forms for the concrete roof partly erected.

At the power house, all units were operated at different times during the month. Units Nos. 1 to 4, inclusive, were overhauled in March. The total power generated during the month was 2,535,530 kilowatt-hours as compared with 4,534,140 in April, 1920. Last year the pumping stations were operated during the entire month. This accounts for the greater output at that time.

Supervision was given to the repairs being made at the Boise power plant by the Idaho Power Co., prior to its being taken back by the Reclamation Service on May 1.

The engineering work at American Falls consisted of topographic surveys, running levels, and making ground water investigations. The topography covered amounted to 10,106 acres, making a total to date of 83,292 acres, and leaving only about 2,500 acres to complete. One party ran 22 miles of levels, making 84 miles of primary and 283 miles of secondary levels run to date.

In investigating ground water conditions around the American Falls Reservoir, 146 farm wells were measured and 6 new wells were drilled to an aggregate depth of 50 feet.

Contract was awarded to Brandt & Bethke, of American Falls, for clearing the new town site of sagebrush, at a price of \$1,500. The area to be cleared is 253 acres, making the average price per acre \$5.93. Fourteen bids were received for this work, ranging from \$1,500 to \$2,530.

Appraisal of property was continued. There were six tracts purchased for \$23,563.34, making 46 holdings purchased to date at a cost of \$130,865.11.

On the North Side Pumping Division three parties made a topographic survey of 6,950 acres, making a total to date of 130,458 acres that have been surveyed on this division.

Shipments of farm products in April were 310 cars. Of the April shipments 76 cars were hay, 25 were wheat and wheat products, 111 potatoes, 26 sugar, and 72 live stock.

A site for the State normal school, which is to be moved from Albion to Burley, was purchased and the deed for it delivered to the State.—*Barry Dibble.*

HUNTLEY PROJECT, MONTANA.

April weather was better than normal, and the operation and maintenance force completed cleaning the laterals and canals and put them in readiness for the delivery of water.

The Austin dragline No. 4 was moved from open drain No. 26 to the main canal above Osborn, where

sufficient material will be excavated from the bottom of the canal to reconstruct the north bank, which has become badly eroded.

Practically all spring seeding was finished, and all that was required to start the farming season off in fine shape was a break in the drought conditions which had prevailed since last July.—*A. R. McGinness.*

MILK RIVER PROJECT, MONTANA.

April weather for a large part of the month was favorable. The temperature was below normal and precipitation about normal. Snowstorms interfered with construction, operation, and maintenance, and farming work at the beginning and end of the month. Seeding was nearly completed. Winter grains were looking well, and so far as known no winter killing of alfalfa occurred. Labor was plentiful and the scale of wages considerably below that of last year. Water supply in the Milk River was ample.

Surveys.—Farm unit and lateral extension surveys were continued.

Construction by contract.—Lodging house at Saco was completed. One earthwork contractor resumed work and made good progress. Specifications were opened and three contracts let for earthwork on lateral extensions. One proposal was opened and contract let for small structures, and the contractor commenced work the latter part of the month in the vicinity of Nashua, Mont. On the 29th bids were opened for enlargement of Nelson Reservoir from 25,000 to 70,000 acre-feet capacity. The low bid of nine received was that of White, Brown & Leahy Co., Great Falls, Mont., at about \$97,000.

Construction by Government forces.—Twenty-four miles of operation and maintenance roads were built, 100 guard posts set at bridges, and a number of checks, drops, wooden turnouts, etc., placed, and also 45 M feet b. m. of lumber were treated in a preservative dip.

Operation and maintenance.—Drag-line operations, one shift per day, were commenced on the 11th, and 3,250 linear feet or 3,820 yards of the Dodson North Canal cleaned. A team crew was organized for cleaning the laterals on the Vandalla division on the 25th, and continued the balance of the month. The work of burning weeds, etc., for putting the canals in shape for the seasons' operations was done, the Dodson North, Dodson South, and Vandalla Canals were put in commission, and the first water delivered to users on April 11. Forty-six water-rental applications were received and eight deliveries made; 12,300 acre-feet of water were delivered to Nelson Reservoir, which was filled to capacity on April 13.—*Geo. E. Stratton.*

ST. MARY STORAGE DIVISION.

April weather conditions were about normal for this section. There were several snowstorms and several high winds, and the latter part of the month was cold and backward. The snow in the mountains at the end of the month was apparently a little less than normal.

During the last week of the month a small crew was started on the reconstruction of canal banks in the vicinity of Powell Creek, a drag-line operator started to move the Bucyrus drag line from the Canadian Customs to the St. Mary Canal, and general preparations were made to put the canal in operation as soon as snow conditions will permit.—*R. M. Snell.*

SUN RIVER PROJECT, MONTANA.

Snowstorms and high winds occurred from the 3d to the 6th of April, and the resulting snowdrifts re-

mained in the ditches and along the banks for several days, delaying ditch repairs and weed burning.

Water for storage in Pishkun Reservoir was diverted from Sun River on the 2d, and the run continued until the 25th, when the reservoir was filled. The maximum flow at the first gauge in the Pishkun Reservoir supply canal was about 160 second-feet. Storage in Willow Creek Reservoir increased gradually during the month but no local run-off occurred. No other canals or laterals on the project were operated.

It was found impossible to secure on the project a sufficient number of teamsters with teams to carry on maintenance work, but the supply from adjoining dry-land farms was plentiful. From three to six crews of men and teams were engaged in cleaning silt from laterals and in raising and strengthening lateral banks. Three crews were in the field during seasonable weather, installing turnouts and weirs on the Greenfields diversion and replacing worn-out structures on the Fort Shaw division, except in a few locations where, subject to alkali action, replacements of turnouts, checks, etc., on the Fort Shaw division are of concrete and iron instead of wood, which was used in the original construction. Telephone line No. 3, between Camp 11 and Sun River diversion, and line No. 2, between Willow Creek Camp and Sun River diversion, were repaired by resetting poles and repairing broken wires.

Farming operations consisted of clearing land of weeds, plowing and disking. A comparatively small acreage of grain was seeded, and land leveling was begun on a few farms. Baling and shipping of alfalfa continued, but the demand was light, and very low prices obtained. The potato market was dull and prices were low. Carload shipments from the project consisted of 13 cars of wheat, 1 of flax, 3 of potatoes, and 15 of hay.—Geo. O. Sanford.

Project weather during April, 1921.

Project.	Station.	Temperature, °F.			Precipitation (inches).
		Maxi-mum.	Mini-mum.	Mean.	
Salt River.....	Phoenix, Ariz.....	96	37	66.1	0.02
Yuma.....	Yuma, Ariz.....	101	38	67.8	0
Orland.....	Orland, Calif.....	92	32	58.2	.24
Grand Valley.....	Grand Junction, Colo.....	76	23	.....	1.16
Uncompahgre.....	Montrose, Colo.....	74	17	45	.77
Boise.....	Boise, Idaho.....	76	26	47	.93
King Hill.....	Glenns Ferry, Idaho.....	82	19	52	.20
Minidoka.....	Burley, Idaho.....	76	19	41.3	2.19
Huntley.....	Ballantine, Mont.....	78	18	43.30	.86
Milk River.....	Malta, Mont.....	78	5	22.8	0.90
St. Mary storage.....	Near Babb, Mont.....	66	6	41	1.56
Sun River.....	Fort Shaw, Mont.....	71	13	42.3	0.81
Lower Yellowstone.....	Savage, Mont.....	75	9	43	.95
North Platte.....	Wynote, Wyo.....	80	16	48.9	T.
Newlands.....	Fallon, Nev.....	90	32	60.6	T.
Carlsbad.....	Carlsbad, N. Mex.....	88	34	61	.01
Rio Grande.....	El Paso, Tex.....	74	14	40	1.66
North Dakota pump-ing.....	Williston, N. Dak.....	76	22	51.4	0.52
Umatilla.....	Hermiston, Oreg.....	71	17	45	0.31
Klamath.....	Klamath Falls, Oreg.....	83	9	47.3	.63
Belle Fourche.....	Orman, S. Dak.....	71	24	45.8	2.06
Strawberry Valley.....	Provo, Utah.....	77	23	48.1	1.81
Okanogan.....	Omak, Wash.....	76	26	50.8	0.45
Yakima.....	Sunnyside, Wash.....	70	23	45.8	0.25
Tieton.....	Cowiche, Wash.....	71	1	39.2	2.60
Riverton.....	Diversion Dam, Wyo.....	75	12	42.1	.01
Shoshone.....	Powell, Wyo.....	61	13	35	1.34
Indian projects:		69	22	46	1.87
Blackfoot.....	Browning, Mont.....	61	13	35	1.34
Flathead.....	St. Ignatius, Mont.....	69	22	46	1.87
Fort Peck.....	Poplar, Mont.....	78	10	43.1	.87

LOWER YELLOWSTONE PROJECT, MONTANA-NORTH DAKOTA.

During April there were 13 clear days and 17 cloudy or partly cloudy days. From the 5th to the 8th of the month 5½ inches of snow fell and at times during this period the weather was very disagreeable.

Satisfactory progress was made in farming operations in spite of the unfavorable weather conditions during the first of the month. It is estimated that 50 per cent of the seeding was completed at the end of the month. The acreage in sugar beets will be about 1,600 acres, which is considered a remarkable showing.

Plans and specifications and design of structures in connection with the extension work was carried on.

Drag-line excavators Nos. 1 and 3 started canal cleaning on the 12th. Machine No. 1 cleaned 2,000 linear feet of silt from the main canal, and machine No. 3 cleaned 3,950 linear feet just below First Hay Creek. The following structures were installed during the month: Six farm turnouts, four concrete checks, and nine concrete drops.

Two bridges on Lateral KK were raised to permit the necessary clearance, the flume on Lateral KK over Sears Creek was raised, and 6,000 linear feet of laterals were cleaned.

There was sufficient moisture for seed germination, and indications were that the first water deliveries for irrigation would be about May 20.—L. H. Mitchell.

NEWLANDS PROJECT, NEVADA.

April weather was unusually cold and killing frosts were recorded on the 7th, 15th, and 25th, probably destroying most of the fruit, which was well advanced as a result of the warm spell in March. Several severe winds caused damage to newly seeded alfalfa and other tender crops.

From April 18 to 20, inclusive, a conference was held in Reno, Nev., attended by Project Manager John F. Richardson, Consulting Engineer D. C. Henny, District Counsel H. A. Cox, Electrical Engineer J. M. Gaylord, and Engineers Ferd Bonstedt and E. B. Debler, at which a board report was made on power and other matters with relation to proposed Spanish Springs Reservoir. On April 29 a boring outfit in charge of Driller J. M. Heizer left Fallon for the Spanish Springs Reservoir Dam site to start testing for water-tightness of foundation.

Construction.—Bids were opened on April 23 for excavation of the Harding lateral, stations 27+36 to 59+80, involving 3,665 cubic yards of earthwork. The bids received ranged from 7 to 20 cents per cubic yard.

Twenty-eight minor timber structures were placed in the lateral system as construction. About 150 feet of embankment at the head of Q lateral were raised by Government forces.

Settlement.—No water-right applications were received during the month, there being no land open to entry on the plats.

Water supply and use.—Lahontan Reservoir storage increased to 173,080 acre-feet on the 18th, but owing to heavy demand for irrigation it was reduced to 169,240 acre-feet by the end of the month. The elevation of water surface in Lahontan Reservoir increased 0.50 foot during the month; that of Lake Tahoe rose 0.17 foot. The distributing system was operated almost to its maximum summer use, owing to the extremely dry winter.

Crop report, Interstate division, North Platte project, Nebraska-Wyoming, 1920.

(Exclusive of N. P. C. & C. Co. lands.)

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	31,625	Ton.....	67,483	2.1	\$10.00	\$674,800	\$21.34
Alfalfa seed.....	30	Bushel.....	30	1.0	15.00	450	15.00
Alfalfa seeded.....	17,254						
Barley.....	3,922	Bushel.....	98,394	25.1	.55	54,115	13.80
Beans.....	86	do.....	661	7.7	3.00	1,983	23.06
Cane.....	261	Ton.....	612	23.5	4.00	2,448	9.38
Clover seed (sweet).....	91	Bushel.....	526	5.8	15.00	7,890	8.67
Corn.....	10,176	do.....	191,671	18.8	.75	143,750	14.12
Corn fodder.....	31	Ton.....	73	2.4	4.00	292	9.42
Garden.....	329					25,463	77.40
Hay (other).....	528	Ton.....	675	1.3	12.00	8,100	15.34
Millet seed.....	335	Bushel.....	3,235	9.7	1.00	3,235	9.66
Oats.....	7,708	do.....	216,507	28.1	.60	129,904	16.85
Pasture:							
Alfalfa.....	1,243				15.00	18,645	15.00
Sweet clover.....	378	Bushel.....			15.00	5,670	15.00
Potatoes.....	5,800	do.....	852,733	147.0	.75	639,550	110.29
Rye.....	611	do.....	5,151	8.4	1.00	5,150	8.43
Sugar beets and tops.....	16,558	Ton.....	173,491	10.5	12.50	2,168,637	130.97
Wheat.....	5,971	Bushel.....	96,453	16.2	1.50	144,680	24.23
Miscellaneous.....	151	do.....				8,838	58.53
Less duplicated areas.....	6,168						
Total cropped.....	86,920	Total and average.....				4,043,600	46.50
			Areas.		Acres.	Farms.	Per cent of project.
Irrigated, no crop:							
Alfalfa seeded with nurse crop.....	6,168	Total irrigable area farms reported.....			108,767	1,325	97
Alfalfa seeded without nurse crop.....	1,080	Total irrigated area farms reported.....			88,005	1,325	79
Wheat, fall seeding.....	490	Under water-right applications.....			87,005	1,313	78
Rye, fall seeding.....	29	Under rental contracts.....			1,000	12	1
Less duplicated areas.....	6,657	Total cropped area farms reported.....			86,919	1,325	78
Total irrigated.....	88,000						

¹ Saved 4,723 acres.

Crop report, Fort Laramie division, North Platte project, Wyoming, 1920.

Alfalfa hay.....	972	Ton.....	1,755	1.8	\$10.00	\$17,550	\$18.06
Alfalfa seeding.....	1,369						
Barley.....	43	Bushel.....	500	12	.55	275	6.40
Beans.....	4	do.....	21	5	3.00	63	15.75
Beets (sugar) and tops.....	759	Ton.....	6,226	8.2	12.50	77,825	102.53
Cane.....	12	do.....	20	2	4.00	80	6.67
Corn fodder.....	46	do.....	48	1	4.00	192	4.17
Corn.....	1,656	Bushel.....	36,258	22	.75	27,195	16.42
Garden.....	13					1,575	121.15
Hay (other).....	286	Ton.....	131	0.5	12.00	1,572	5.50
Oats.....	2,250	Bushel.....	83,664	37	.60	50,200	22.31
Pasture:							
Alfalfa.....	70	Acre.....			15.00	1,050	15.00
Sweet clover.....	9	do.....			15.00	135	15.00
Potatoes.....	248	Bushel.....	28,405	115	.75	21,305	85.90
Wheat.....	2,050	do.....	35,938	17	1.50	53,907	26.24
Miscellaneous.....	72					256	3.56
Less duplicated areas.....	369						
Total cropped.....	8,490	Total and average.....				253,180	29.81
			Areas.		Acres.	Farms.	Per cent of project.
Irrigated, no crop:							
Alfalfa seeding without nurse crop.....	40	Total irrigated area farms reported.....			3,537	126	8
Wheat, fall seeding.....	224	Under rental contracts.....			8,537	126	8
Less duplicated areas.....	224	Total cropped area farms reported.....			8,494	126	8
Total irrigated acreage.....	8,530						

¹ With nurse crop and 43 without.

Operation and maintenance.—Maintenance work consisted of the following: Cleaning about 8.5 miles of laterals in the Fernley and Soda Lake districts, using Government teams and scrapers. Ten minor wooden structures were installed, while 18 structures were repaired or enlarged.

With the exception of a small washout under the main V canal spillway, which required three days to repair, no serious breaks occurred in the canal system.

Austin drag line No. 5 finished cleaning and raising the banks of the S2 lateral for a distance of about three-fourths mile, after which it was moved to headquarters for overhauling.

The silt blanket in the Truckee Canal at the place where the big break of January 2 occurred was completed, and is proving very satisfactory in preventing seepage through the repaired section of embankment.

Carson Lake pasture.—During the month 605 head of cattle and horses were placed in the pasture for grazing.—*John F. Richardson.*

CARLSBAD PROJECT, NEW MEXICO.

April weather was cold and windy until late in the month; too cold, in fact, for the germination and growth of crops until about the 25th.

Maintenance work included the continuation of the cleaning work in the open drains by the Austin drag line. The machine completed work on the C Drain on the 9th, and was moved to D Drain between the 9th and the 15th, requiring six days to make the move. Work started on D Drain on the 15th and was still uncompleted at the end of the month. Twenty-one hundred linear feet of D Drain were completed. This drain was in bad condition, the sides having sloughed badly since the initial construction. It was necessary to remove about 2 feet of mud. There were no serious delays, the machine having done satisfactory work. The regular maintenance foreman was engaged in making minor repairs in the lateral system during most of the month. The canal was operated under a full head during the entire month.

There was no drainage construction during the month.

The total run-off of the Pecos River amounted to 320 acre-feet, and the average run-off per day was about 180 acre-feet.

Labor was plentiful for all classes of work and there was considerable idle labor. Wages on the farms dropped to about \$1.50 per day.

The farmers were busy during the early part of the month distributing fertilizer on the alfalfa fields and preparing for the planting of annual crops. Cotton planting commenced about the 1st and was still in progress at the end of the month. Cotton planted about the 1st was not up until about the 25th and in some cases had to be replanted. Good stands were being reported on the later plantings. The alfalfa crop made little progress in growth during the month, except on fields which were grazed until late in March. It was estimated that harvesting would commence about the 15th of May. A few fields were being harvested at the end of the month, but it seemed probable that the bulk of the crop would not be harvested until near the 1st of June. Financial affairs on the project and the outlying regions were very unsatisfactory, and farmers especially were finding it increasingly hard to finance the year's operations. Buyers were offering to contract early cutting of alfalfa at prices around \$11 or \$12 per ton.—*L. E. Foster.*

RIO GRANDE PROJECT, MEXICO-TEXAS.

April weather was very warm, although there were several nights during which frost occurred.

The total inflow at San Marcial for the month amounted to 49,322 acre-feet. The inflow for the same period last year was 138,478 acre-feet. The inflow for the year 1921 will probably be very light. However, there is plenty of water now stored to carry the project through two years.

Maintenance crews were employed removing weeds from drains. The high winds made this an almost constant performance. Several small breaks occurred which were handled by the regular maintenance crews. A brush and straw mat was placed on the inside slopes of the West Side and Chamberino Canals along sandy portions of the reconstructed sections to prevent sloughing of banks.

North Platte Canal & Colonization Company lands, North Platte project, Wyoming, 1920.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.			
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre	
Alfalfa hay.....	4,434	Ton.....	9,087	2.0	\$10.00	\$90,870	\$20.49	
Barley.....	96	Bushel.....	3,137	33.0	.55	1,725	17.97	
Sugar beets.....	1,115	Ton.....	10,674	9.6	12.50	133,410	119.66	
Cane.....	36	do.....	75	2	4.00	300	8.33	
Corn.....	1,480	Bushel.....	28,512	19	.75	21,380	14.45	
Oats.....	870	do.....	22,768	26	.60	13,660	15.68	
Potatoes.....	972	do.....	153,504	158	.75	115,130	118.44	
Rye.....	102	do.....	445	4	1.00	445	4.36	
Wheat.....	265	do.....	3,720	14	1.50	5,580	21.06	
Less duplicated areas.....								
Total cropped.....	9,370	Total and average.....					382,500	40.80
			Areas.		Acres.	Farms.	Per cent of project.	
Alfalfa seeding with nurse crop.....	414	Total irrigated area farms reported.....		9,635	125	.....	
Alfalfa seeding without nurse crop.....	260							
Less duplicated areas.....	414							
Total irrigated.....	9,630							

A board of survey composed of H. H. Brook, president of the Elephant Butte irrigation district, C. A. Peavey, chief clerk, and T. W. Parry, irrigation manager, held a four-day session at Las Cruces to discuss with water users the advisability of putting in operation certain regulations to improve the operation conditions.

The change in destination to the Shoshone project of the class 14 Bucyrus drag-line excavator ordered for the Rio Grande project and the increase in allotment of \$60,000 by advance from the 1922 allotment made it possible to restore the two-shift operation on the drag-line excavators doing the most urgent work and to proceed with construction of some of the most urgently needed lateral extensions.

At Elephant Butte construction of the embankment paving proceeded, and was 70 per cent complete at the end of the month. Excavation of the spillway channel is 70 per cent complete. The concrete chuting tower for concreting the spillway was under construction.

In the Rincon Valley the only construction in progress was the Garfield drain.

In the Mesilla Valley three drag lines continued on drainage construction and two on lateral construction, all working one shift, excavating 99,700 cubic yards from 1.7 miles of drain and 28,000 cubic yards in 2.6 miles of lateral.

In the El Paso Valley one Bucyrus drag-line excavator continued the construction of the Fabens drain and three machines continued on canals and laterals; 57,000 cubic yards were excavated in the Fabens drain and 46,000 cubic yards were placed in canal banks.

The Jennings Construction & Engineering Co. excavated 3,800 cubic yards in the Tornillo drain.

Unofficial visitors on the project included two Chinese engineers, H. S. Sung and T. L. Shen, of Shanghai, China, and a party of four French engineers, Messrs. Maurice DeGove, Eugene Touche, Paul Feully, and Andre Chimel. L. Wehner, chief engineer of the Pawling & Harnischfeger Co., visited the project, inspecting the P. & H. No. 206 drag-line excavators. S. M. Wiess, representing the Bucyrus Co., was also a visitor.—L. M. Lawson.

Crop report, Rio Grande project, New Mexico-Texas, 1920.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	27,099	Ton.....	82,141	3.03	\$23.13	\$1,900,000	\$70.11
Alfalfa seed.....	152	Bushel.....	443	2.91	17.27	7,650	50.34
Apples.....	510	Pound.....	863,350	1,691.18	.03	26,400	51.72
Barley.....	909	Bushel.....	20,352	22.39	1.48	30,106	33.12
Beans.....	615	.....do.....	5,392	8.76	3.75	20,215	32.84
Cabbage.....	119	Ton.....	5,627	5.27	56.45	35,392	297.41
Cane.....	1,699	.....do.....	5,695	3.35	11.60	66,040	38.88
Cantaloupes.....	2,232	Crate.....	642,785	287.99	.20	131,770	59.04
Chili.....	20	Pound.....	49,000	2,450.00	.06	2,907	145.35
Corn fodder.....	498	Ton.....	892	1.79	8.09	7,214	14.48
Corn:							
Indian.....	10,544	Bushel.....	224,527	21.30	1.38	310,617	29.46
Sorghum, cane.....	88	Ton.....	284	3.23	12.18	3,460	39.32
Sorghum, seed.....	268	Bushel.....	6,654	24.87	1.07	7,150	26.73
Cotton.....	15,996	Pound.....	6,972,332	435.88	.16	1,141,400	71.35
Cotton seed.....	6,870	.....do.....	3,963,689	576.96	.01	46,894	6.82
Flowers (roses).....	8	Bushel.....				15,969	1,996.12
Fruits, small.....	177	Pound.....	346,820	1,959.44	.04	15,780	89.15
Garden.....	2,373					195,620	82.44
Hay.....	785	Ton.....	1,402	1.78	16.46	23,080	29.40
Millet seed.....	10	Bushel.....	160	16.00	1.91	306	30.60
Oats.....	332	.....do.....	11,773	35.46	.92	10,888	32.80
Onions.....	131	.....do.....	19,839	151.41	1.25	24,727	188.76
Pasture.....	5,120					68,730	13.42
Peaches.....	47	Pound.....	48,880	1,023.92	.04	1,992	42.16
Pears.....	576	.....do.....	2,066,820	3,596.67	.04	88,015	152.74
Peas.....	114	Bushel.....	2,334	20.43	2.73	6,368	55.74
Potatoes:							
Sweet.....	365	.....do.....	33,670	92.25	1.34	45,155	123.71
White.....	9	.....do.....	166	18.44	1.42	236	26.22
Prunes.....	9	Pound.....	33,000	3,666.67	.04	1,320	146.66
Rye.....	71	Bushel.....	1,220	17.18	2.34	2,860	40.28
Tomatoes.....	30	Pound.....	116,100	3,870.00	.04	4,340	144.67
Truck, small.....	33					3,150	95.45
Watermelons.....	116	Pound.....	391,584	3,375.72	.03	12,350	106.47
Wheat.....	8,335	Bushel.....	166,974	20.03	2.28	381,099	45.72
Less duplicate areas.....	8,380						
Total cropped.....	77,880	Total and average.....				4,639,200	59.60
		Areas.	Acres.		Farms.	Per cent of project.	
Irrigated, no crop:		Total irrigable area farms reported.....	139,246		3,180		
Miscellaneous.....		Total irrigated area farms reported.....	82,956		3,180		
Less duplicated areas.....		Under rental contracts.....	83,065		3,295		
Total irrigated.....		Total cropped area farms reported....	77,880		3,180		

NORTH DAKOTA PUMPING PROJECT.

April weather was fair for agricultural and project work, but both classes of work would have been further advanced if it had been warmer and more seasonable. Unusual winds prevailed.

The Missouri River broke up and the definite ice flow occurred on the 3d. As the water receded the formation of a sand bar was apparent in the curve of the river where the pumping station is located. The development was being watched carefully, as it could duplicate the action at the Buford station, which was entirely isolated.

Repairs on the floating pumping station were completed and repairs begun on the station pontoon for the support of the discharge pipes. With the placing of two sections of the launching ways the barge can be launched.

The power plant was operated for the commercial power contract; 84,050 kilowatt-hours of electrical energy were delivered to the city of Williston. This was an increase of 11,710 kilowatt-hours over the same month of last year.

Seven hundred and sixty-seven tons of coal were mined.—*Wm. S. Arthur.*

UMATILLA PROJECT, OREGON.

High temperatures prevailed throughout April. The mean temperature for the month was 51.4°, being 9° higher than the average mean for this month for 14 years previous. The absence of a late killing frost was especially gratifying, as fruit conditions, with the exception of peaches and apricots, were exceptionally favorable.

Farming operations.—Shipments of hay continued to be made, a total of 60 cars being marketed during the month. Practically the entire project had received its first irrigation at the close of the month. Alfalfa made an average growth and fruit trees displayed a heavy bloom.

Labor conditions.—For the limited amount of work in progress the labor supply was more than adequate.

Operation and maintenance.—The feed canal was operated throughout the month, diverting from 49 to 261 second-feet, of which 30 second-feet were delivered continuously to the Echo Mills and from 60 to 195 second-feet to Cold Springs Reservoir. The feed canal was not operated for storage until the 9th. On April 30 the available storage in Cold Springs Reservoir was 47,100 acre-feet. The distribution canals were operated continuously throughout the month. From 75 to 125 second-feet were diverted by the West Extension Main Canal, and from 40 to 147 second-feet were diverted by Canal A. From 35 to 95 second-feet were also diverted by the Maxwell Canal. Owing to the water-users' delay in making preparations for the season, the demand for water was very heavy throughout the month. On the East Side Division two small crews were employed on general maintenance of canals, laterals, structures, and drains. On the West Side Division one small crew was employed on miscellaneous maintenance work.

Construction.—On April 2 all work planned on Canal A for the spring season was completed and the crew disbanded or transferred to other work; 98 cubic yards, or 1,176 square yards, of concrete were placed. On the East Side Division the manufacture of concrete pipe was commenced on the 11th and at the close of the month 780 12-inch, 815 16-inch, and 669 20-inch concrete pipe had been made. On supplemental construction, District No. 33, 2,175 linear feet of lined lateral were constructed and three

farm turnouts were installed. On the West Side Division 412 linear feet of 18-inch and 1,300 linear feet of 15-inch concrete pipe was laid and two farm and one canal structures were installed on lateral No. 000. One farm turnout was installed on lateral No. 43; 1,024 linear feet of lined lateral were constructed and one canal structure installed on lateral 20f; 30 linear feet of lined lateral were constructed and one farm turnout installed on lateral 17b.

Visitors.—Thomas F. Jardine called at the project office on April 18 in the interest of agricultural development. On April 21, C. W. Paine, district secretary of the Civil Service Commission at Seattle, Wash., visited the project.—*Maurice D. Scroggs.*

KLAMATH PROJECT, OREGON-CALIFORNIA.

April weather was generally favorable for all outdoor operations. The farmers were busily engaged in preparing the ground for the season's crop.

Bids for the leasing of the Tule Lake marginal lands were opened on April 18. Fifty-seven lots, comprising a total area of about 4,500 acres, were advertised. The bids received ranged from 62½ cents to \$5.04 per acre.

The diversion canal was operated throughout the month, diverting flood water from Lost River to the Klamath River. Water for priming purposes was turned into the canal system on the 28th.

The force of 12 ditch riders started work on the 1st. Each ditch rider had a crew of two to eight men and teams engaged in cleaning and preparing the canal and lateral system for the season's run. Four repair crews, consisting of four men each, were engaged in installing new structures and in repairing old ones.

One survey party was engaged on general work and in giving grades and line for the headworks on the C-G Canal, the concrete-lined section on the C Canal, and the precast flume job. One survey party was engaged in making the final location surveys for the J Canal.

Office studies for the final location of the J Canal and lateral system were completed. Drawings were completed for the form work for the structures on the C-G Canal. Work was in progress detailing the steel reinforcement for the lower diversion dam on Lost River. Bids for the construction of the diversion dam will be opened on May 10.

Excavator No. 122235 was engaged in the construction of the extension to No. 6 drain from the 1st to the 27th and then moved to the 2-B drain of the Upper Van Brimmer irrigation district. Excavator No. 121248, a new machine, was engaged in cleaning the Slaughter House drain and the 1-G-1 drain. Excavator No. 121473, a new Bucyrus machine, was received March 29. The work of erecting the machine was completed April 20. From the 20th to the end of the month the machine was being moved to the C-G Canal.

A crew of about 75 men was employed at Camp C. The concrete lining was placed in the C Canal between the upper end of the flume and the C-G headworks, a distance of 350 feet, amounting to 123 cubic yards. The construction of the C-G headgate structure was completed and the two radial gates and hoists were installed. One hundred and twenty-five yards of concrete were placed in the headgate structure and 40 cubic yards in protection work above the structure.

Practically all of the preparatory work for the precast flume on the C Canal was completed. The precast flume will replace a timber flume which was constructed in 1908-9. The new flume will be 4,300

feet long, 11 feet wide, and 6 feet high. The pedestals supporting the old timber flume will be utilized in the new structure. The bents, stringers, and the flume sections, the latter in units 4 feet 3 inches in length, will be cast at the side of the present structure during the coming summer months. The flume barrel will be cast in an inverted position. About 3,000 cubic yards of concrete and 700,000 pounds of reinforcing steel will be required in the manufacture of the new flume. The mixer and other concreting apparatus will be mounted on a traveling platform which will straddle the flume section forms; the concrete will be chuted to the forms. On April 28, a few units were poured, principally to test out the forms. Actual concreting will begin early in May.—*Herbert D. Newell.*

BELLE FOURCHE PROJECT, SOUTH DAKOTA.

April weather was unusually windy and dry with only .61 inch of precipitation. Roads were good all of the month.

Threet Bros., contractors for earthwork excavation on the Willow Creek division, did not arrive on the project during the month. They were expected to establish camp soon. Proposals were issued and bids received for the construction of one three-room cottage for ditch rider's headquarters, Denver office standard design. The lowest bid was \$1,821 by Milan Malcolm. Proposals will be issued during the month for the hauling of approximately 2,000 yards of gravel and sand and also for cement and reinforcing steel for the Willow Creek siphon. One field party

worked all month cross-sectioning canals in the Willow Creek division.

The weather was favorable for field work and a large amount of maintenance was accomplished. There were 20 small crews working in various places on the project under subforemen. The canals and laterals were in first-class condition for the season's run; they were, in fact, in much better shape than they had been for a number of years. Water was turned into the Johnston lateral on the 18th, and 514 acre-feet were delivered to farmers. The feeder canal was run about half of the month, and the total storage at the end of the month was 188,215 acre-feet.

The operator for the drag line arrived on the 25th and began erecting the machine. Work will be started with this machine on the canals as soon as it is put into commission.

The seeding of small grains was practically completed and some plowing for corn was in progress. Alfalfa was beginning to show green, but was making practically no growth on account of continued cold nights. Wheat dropped to \$1.05 a bushel and there was no market whatever for hay. The last report on butter fat was 25 cents a pound. Project stock was in good condition. Most of the sheepmen were getting ready to move onto the range. The grass was beginning to show up sufficient to sustain the herds. The percentage of increase in lambs was, on the average, about 100 per cent, although some herds where well taken care of produced from 125 to 140 per cent. The price of hogs dropped to 5 cents locally and the price of cattle is correspondingly low. The outlook for the farmer to pay his bills, un-

Comparison between operation and maintenance estimates and results, Jan. 1 to Apr. 30, 1921.

Project.	Gross cost.				Accruals.				Area that can be irrigated, 1921.
	Estimate for 1921.		Actual cost to Apr. 30.	Amount *over or under.	Estimate for 1921.		Actual returns to Apr. 30.	Amount more or *less than estimate.	
	Total for year.	To Apr. 30.			Total for year.	To Apr. 30.			
Belle Fourche.....	\$120,000	\$34,000	\$40,000	*\$6,000	\$148,000		\$800	\$800	<i>Acres.</i> 82,800
Boise.....	335,000	115,000	128,000	*13,000	311,500	\$12,000	19,000	7,000	165,800
Carlsbad.....	50,000	22,900	22,000	900	52,000	13,200	16,900	3,700	25,000
Grand Valley.....	60,000	20,300	22,400	*2,100	61,400	2,000	4,700	2,700	38,350
Huntley.....	75,000	23,000	24,400	*1,400	88,600				31,300
Klamath.....	75,000	24,700	18,600	6,100	87,900				52,500
Lower Yellowstone.....	66,000	16,000	14,500	1,500	65,000				38,700
Milk River.....	90,000	12,500	13,400	*900	45,000	800	800		*74,500
Minidoka.....	134,000	39,500	37,500	2,000	134,000				49,000
Newlands.....	118,700	57,500	66,000	*8,500	120,600	8,300	22,500	*4,200	69,300
North Dakota Pumping ¹	58,600				26,800				7,650
North Platte—Interstate ¹	275,000				342,800				*129,900
North Platte—Ft Laramie ¹	63,000				24,000				14,000
Okanogan.....	35,000	9,300	15,000	*5,700	41,700				8,000
Orland.....	35,000	9,700	12,800	*3,100	41,200	6,800	6,800		20,500
Rio Grande.....	242,500	109,000	130,000	*21,000	249,000	55,000	49,500	*5,500	118,000
Shoshone.....	108,600	36,000	32,000	4,000	126,000	1,000	11,300	*10,300	65,800
Strawberry Valley.....	87,500	30,000	33,400	*3,400	60,300	1,500	700	*800	59,100
Sun River—Fort Shaw.....	20,000	6,400	6,800	*400	26,400				12,200
Sun River—Greenfields.....	25,000	6,500	7,300	*800	10,000				25,100
Umatilla.....	53,000	19,300	18,700	600	49,300	4,600	5,400	800	26,300
Uncompahgre.....	145,000	50,000	66,000	*16,000	152,300	42,400	40,200	*2,200	100,000
Yakima—Sunnyside.....	135,000	48,000	54,000	*6,000	150,500	25,000	27,000	2,000	110,800
Yakima—Tieton.....	92,000	31,200	33,300	*2,100	103,200	4,300	2,000	*2,300	32,000
Yuma.....	233,000	56,000	62,000	*6,000	300,000	84,000	88,000	4,000	61,300
Total.....	4,271,900	776,800	858,100	*81,300	2,817,500	260,900	295,600	34,700	1,417,900

¹ Report not received from project in time for publication.

² Stored water is furnished through St. Mary Canal for 21,600 acres additional.

³ Includes 17,000 acres for which water is carried in main canal.

⁴ Total estimated net cost is \$2,652,118.

less conditions improve, is not encouraging.—*B. E. Hayden.*

STRAWBERRY VALLEY PROJECT, UTAH.

April weather was generally mild and favorable, with intermittent storms throughout the month. Heavy frosts on the 6th and 27th damaged to some extent the plum, cherry, and peach crops.

Farming operations.—At the end of the month practically all crops were planted. Alfalfa and grain crops were in excellent condition. The irrigation season began on the 23d, when the High Line division called for 25 second-feet of water, and on the last day of the month this division was using 180 second-feet of water and the Spanish Fork River was discharging 550 second-feet.

Labor conditions.—All classes of labor were plentiful.

Operation and maintenance of storage works.—Work on repairs to Strawberry Tunnel continued between stations 112 and 120, and 240 linear feet of reinforced concrete floor and 26 concrete bays were put in. Between stations 75 and 120, 4,740 linear feet of double fillets were placed on the floor and six temporary timber sets put in. The crushing plant handled 250 cubic yards of material and the mixing plant 308 cubic yards of concrete.

Transportation over Diamond Fork Road improved, and at the close of the month the road was in good condition between Diamond Switch and mile post 20.

Hydroelectric power plant operations.—The power plant was operated without interruption and power furnished to the towns of Spanish Fork, Payson, Springville, and Salem.

General.—Repairs to No. 1 exciter turbine unit were completed and work was begun on Unit No. 2.

The telephone and transmission lines were in good service throughout the month.

The 10 by 6½ foot radial gate for the head of the lower wasteway at the power plant was received and the work of installing it begun.—*W. L. Whittemore.*

OKANOGAN PROJECT, WASHINGTON.

April weather was generally mild, with snow in the mountains melting slowly and most of the water going into the ground.

Two or more men were employed continuously on mechanical work in connection with the project machinery and automobiles, the greater part of this time being spent on the erection of the substation for the Robinson Flat Pumping Plant. A force of men was employed on the replacement of minor structures and the cleaning of the canals and laterals. Water was run from both Johnson Creek and Salmon Creek into Duck Lake. The inflow into the Conconully Reservoir amounted to 1,248 acre-feet, which is below normal for April, because of its freezing in the mountains every night.

A few apples were left in the project storehouses, being small in size and for which there was no market to date. The price of hay remained the same, with no local hay for sale, and practically all used being shipped in from outside points.—*Calvin Casteel.*

YAKIMA PROJECT, WASHINGTON.

The prevailing temperature during April was below normal, with high winds throughout the latter half of the month. Precipitation was less than normal. Depth of snow on the ground at the reservoirs at the close of the month was as follows: Keechelus, 8 inches; Kachess, 0; Cle Elum, 0; and Bumping Lake, 15 inches. No snow remained on the ground at these reservoirs at this time last year.

Operation and maintenance, Sunnyside division.—Operation on this division was interrupted for several days by a break in the Main Canal which occurred on the 7th at Mile 34.6. Repairs were begun on the 8th and completed on the 11th. Diversion at the beginning of the month was about 500 second-feet, and by the 7th approximately 800 second-feet were being diverted. Delivery of water to lands below the break was delayed from three to five days. At the close of the month the diversion had reached 1,200 second-feet. The Outlook and Snipes Mountain pumping plants were operated, with the exception of the period covered by repair of the canal break, as was also the hydraulic unit of the Grandview plant, the electric unit at this plant being put in operation on the 12th. The Spring Creek plant of the Prosser irrigation district was started on the 11th, and the Prosser plant on the 12th. Average delivery for the month to the various irrigation districts was as follows: Outlook, 44 second-feet; Snipes Mountain, 17.5; Grandview, 29; Prosser, 11; and Sunnyside, 39.

Tieton division.—On the 10th of the month 15 second-feet were diverted from the North Fork, and a like amount from the South Fork of Cowiche Creek, and turned into Laterals C and K to supply the demand for spraying. Additional water was drawn from the same source of supply on the 13th for the small main laterals. The first diversion for irrigation purposes was from the Tieton River on the 16th, when 30 second-feet were diverted, this quantity being gradually increased to 230 second-feet at the close of the month, in preparation for the regular rotation schedules on May 1. Deliveries were made only on demand. Operation was without unusual incident, with the exception of the 29th, when an exceptionally high wind carried large quantities of tumble weeds into the main laterals, and caused considerable difficulty in operation of the smaller laterals, requiring diligent work on the part of the patrol force to keep them cleared of weed jams. Maintenance consisted of the usual spring cleaning and repair of main canal, and adjustment of spillway machinery; also repair, replacement, and construction of delivery structures, and cleaning of sublaterals.

Storage division.—The reservoir gates at Bumping Lake were open the entire month; the gates at Keechelus, Kachess, and Cle Elum remained closed, except for some small regulation toward the end of the month.

New divisions.—Work was continued on main canal estimate for the Roza division. Estimate and report on the Moxee division was forwarded to the Chief Engineer on the 28th.

Miscellaneous.—Contract covering sale of water right to the Kennewick irrigation district for 150,000 acre-feet to be furnished from the storage supply of Yakima project, was signed by the board of directors of the district on the 7th, and transmitted for execution by the department.—*J. L. Lytel.*

TIETON DAM.

April weather was excellent the first part of the month, but rain and snow, accompanied by winds, prevailed during the latter part.

Camp was reopened March 26 with a small crew engaged in getting the camp buildings ready for occupancy.

A board of engineers, consisting of Engineers Weymouth, Henny, Munn, Savage, Lytel, Crownover, and Crowe met and formulated construction plans as embodied in the report of board of engineers dated April 1, 1921. Active construction work was started immediately thereafter, which consisted of clearing,

grubbing, and stripping the dam site, core wall excavation, diversion tunnel excavation, placing rock fill in embankment, constructing Power House No. 2, operating sawmill, and general repairs to the camp and to the road to Naches.

On the 21st to the 25th rock drill demonstrations were given by representatives of the Sullivan Machinery Co., The Ingersoll-Rand Co., and the Denver Rock Drill Manufacturing Co.

Labor was plentiful, with the supply far exceeding the demand. The common labor wage was \$3.60 per day. Average force employed was 275 men.—*F. T. Crowe.*

RIVERTON PROJECT, WYOMING.

April weather conditions were favorable for construction. The temperature was about 3° lower than normal. A heavy, wet snow fell on the 5th and a heavy rain occurred on the 14th, putting the roads in very bad condition. Late in the month the roads had become dry, but were very rough.

The unloading and erecting of drag line No. 121474 were completed and the machine left Riverton for the work on the 11th, reached a point on the canal about 34 miles from town on the 21st, and began excavation on the following day. This machine was operated two shifts during the remainder of the month, excavating earth.

Drag line No. 121322 continued excavating to grade along the side hill, moving shale. This machine was operated two shifts throughout the month.

Drag line No. 121323 was operated two shifts throughout the month. It completed the excavation of sandstone to grade on its portion of the side hill, moved a considerable amount of earth from the reducing section, and began work on a rock point at station 160.

The total amount of material excavated from the Wyoming Canal by the three machines was 56,376 cubic yards, all of which was excavated from the canal prism. Of this material, 18,267 cubic yards were class 1, nearly all of it being earth; 30,018 cubic

yards class 2, a hard, sandy shale; and 8,091 cubic yards class 3, a sandstone requiring blasting. In addition to the above, drag line No. 121323 excavated 1,400 linear feet of cut-off trench under the lower bank of the canal.—*H. D. Comstock.*

SHOSHONE PROJECT, WYOMING.

April was dry and windy and favorable for all kinds of outdoor work.

Water supply.—The Shoshone Reservoir dropped steadily throughout the month, water being supplied to meet the services and other appropriators' requirements.

Operation and maintenance.—Water was shut out of the canal system from the 6th to the 11th, on account of windy storms and cold weather. Twenty-three thousand acre-feet were diverted from the river, of which 11,500 were delivered to farmers. About 20,000 acres of land were irrigated. The maximum rate of diversion was 725 second-feet. A large amount of maintenance work consisted of the usual bank protection work and puddling around structures incident to the first running of water in the canal system. Considerable trouble was also occasioned by weeds blowing into the canals. The P. & H. dragline began the Frannie Canal cleaning on the 15th and cleaned 3,000 linear feet during the balance of the month.

Crops.—The work of irrigating and seeding crops was 10 days in advance of the usual time. Over one-half of the cereal crops was seeded and a large per cent of the beets was also planted. There was little activity in the marketing of crops, and there was no market for alfalfa hay. The following shipments were made during the month: 6 cars of hay; 1 of potatoes; 1 of wheat; 2 of sheep, and 2 of cattle.

Labor.—The labor situation was satisfactory the entire month. A reduction of 50 cents per day in all classes of labor will be made effective May 1. The wage for common labor will then be \$3.50 per day.

Drainage.—The following tabulation shows the progress of the drainage excavation:

Machine.	Number.	Area.	Drain.	Linear feet.	Cubic yards.	Date of commencement of work.
Bucyrus.....	121324	North Garland.....	No. 23.....	4, 275	28, 768	Mar. 9
Do.....	11128	Frannie.....	102 and 103.....	2, 095	12, 329	Mar. 31
Do.....	121472	North Garland.....	No. 27.....	4, 720	27, 203	Apr. 11
Do.....	121475	Frannie.....	No. 104.....	800	2, 756	Apr. 25
Monighan.....	12426	West Garland.....	Z.....	1, 985	11, 356	Apr. 4
Lidgerwood.....	113210	South Garland.....	X-92 and X-92-82.....	2, 685	18, 394	Apr. 5
P. & H.....	121153	Frannie.....	Sage Creek.....	2, 960	6, 814	Do.
Do.....	121161	O. & M.....	Frannie Canal.....	3, 055	5, 000	Apr. 15
Austin trencher.....	42112	West Garland.....	H.....	2, 200	1, 835	Mar. 17

The Austin trencher worked only eight days during the month on account of a shortage of tile. The P. & H. No. 121161 did a considerable amount of miscellaneous work prior to beginning Frannie Canal cleaning, in the nature of structure excavation and back filling on drain 28. The Bucyrus machines Nos. 121472 and 121475 are new machines just received on the job. No. 121475 was received at Mantua on the 9th, and the period from that date to the 25th was occupied in setting it up and moving it to the job.

Field and office engineering.—Field work was carried on by two crews on the Frannie division and one crew on the Garland division. One crew on the Frannie division was engaged on topographic sur-

veys in connection with drainage studies and the other two crews were engaged upon work incident to drainage and construction. Office work consisted of the completion of the project history, completion of farm unit plats for the next unit of opening on the Frannie division, and preparation of data and drawings in connection with construction work.

Construction.—Construction work on the fourth part of the Frannie division was practically completed during the month and the mess at Frannie was discontinued. At Shoshone Dam excavation of the power-house site and power tunnel was continued and the open excavation on the by-pass was completed. One hundred and twenty-two linear feet of tunnel were excavated during the month and 1,590

cubic yards of class 1 and 3 material excavated from the power-house site and by-pass. On April 3 the north 42-inch pipe was closed by means of a wooden ball. This resulted in securing complete control of the discharge from the reservoir by means of the balanced valves. As a result of this control, it was possible to completely shut off the stream flow during parts of two Sundays, at which time a number of large rocks at the head of the rapids, which control the elevation of the pool below the dam, were drilled and blasted, thereby lowering the elevation of that pool about 1 foot.—*J. S. Longwell.*

INDIAN PROJECTS, MONTANA.

BLACKFEET PROJECT.

April weather conditions were about normal. There were several snow storms and frequent high winds, and the latter part of the month was cold and backward.

The farming operations were hindered somewhat on account of the weather, but on the whole fair progress was made in getting the ground in shape and getting crops in.

Eight miles of telephone line between headquarters and the Badger-Fisher system were constructed; a small amount of treated lumber for minor structures was hauled to the field and placed; four operation camps were opened for the season and miscellaneous repairs were made on canals and structures. No canals were operated.—*R. M. Snell.*

FLATHEAD PROJECT.

At Pablo Feed Canal excavation progressed during April from Station 1391+00 to 1400+00, a distance of 900 feet, involving 3,754 cubic yards of material, of which 2,554 were class 1 and 1,200, class 2. Station 1400+00, reached on the 7th, marked the completion of excavation.

Work was resumed at Dry Creek headworks and 210 cubic yards of material were removed from the pool.

At Dry Creek Canal clearing and grubbing progressed from Station 80+00 to 57+00, a distance of 2,300 feet. Excavation amounted to 2,734 cubic yards, of which 1,784 were class 1, 800 class 2, and 150 class 3. This work was done between Stations 100+00 and 79+00. At the drop from the canal into the pool above Dry Creek headworks excavation amounted to 154 cubic yards.

All construction was done by Government forces.

Plowing and seeding were in progress and winter wheat was in good condition.

Live stock was in excellent condition.—*N. B. Hunt.*

FORT PECK PROJECT.

April weather was about normal as to mean temperature, but several snowstorms hindered construction work.

Camp was established at Siphon Station 268 on Poplar River West Canal B, and at the end of the month excavation was about half completed and concrete was being placed. The P. & H. drag line was operated throughout the month, cleaning and enlarging Poplar River East Canal C, but was handicapped by hard material and frost.

Considerable seeding was done, but the acreage will be much less than last year.—*S. A. Kerr.*

GENERAL OFFICES.

Washington office.—Director Davis was in charge of the office during the first half of the month. On

April 18, accompanied by Chief Counsel Hamele, he was in New York for a conference with officials of the Idaho Power Co. relative to power rights at the proposed American Falls Dam, Minidoka project, Idaho. On April 20 he left Washington for Houston, Tex., to attend the fifty-first annual convention of the American Society of Civil Engineers, planning later to visit the Lower Rio Grande, Rio Grande, and Yuma projects, the Imperial irrigation district, the Boulder Canyon dam site, and the proposed Green River project in Utah.

During the absence of the director the office was in charge of Assistant Director Morris Bien as acting director.

Except as above noted, the chief counsel was in the office throughout the month.

The following matters were submitted to the secretary during the month and were acted on by him as indicated:

April 16, recommending approval of a draft of public notice announcing operation and maintenance charges on the Umatilla project for 1921, and thereafter until further notice; approved April 25.

April 20, reporting favorably on House joint resolution 52, to authorize the Secretary of the Interior to furnish water to applicants and entrymen in arrears for more than one calendar year of payment for maintenance or construction charges; signed April 21, 1921.

April 20, recommending approval of rental rates for water on the Carlsbad project for 1921; approved by letter April 22, 1921.

April 20, recommending that authority be granted to execute a contract with the Gering irrigation district, North Platte project, for the construction of a drain at a cost of approximately \$87,000; approved April 30, 1921.

April 21, recommending that the Service be authorized to postpone to December 31, 1921, issuance of notices of default in payment of water charges, as provided in section 2 of the act of August 9, 1912; approved April 21, 1921.

April 21, reporting adversely on bill S. 219, providing for examination and survey for irrigation works for storage and diversion and development of waters on the watershed of Truckee River; signed April 30, 1921.

April 22, reporting adversely on bill S. 567, providing for a reclamation project on Price River, Utah; signed April 30, 1921.

April 22, reporting adversely on bill S. 566 providing for the Castle Peak project; signed April 30, 1921.

April 23, reporting favorably on bill H. R. 2425, amending section 2 of the act of August 9, 1912, applying the penalties of the extension act to cases coming under the act of August 9, 1912, and substituting a statutory foreclosure in accordance with State law in place of automatic transfer of title immediately upon failure to pay water charges; signed May 2, 1921.

April 23, reporting adversely on bill S. 568 providing for an appropriation of \$5,000,000 for the construction of an irrigation project on Green and Grand Rivers, Utah; signed May 2, 1921.

April 26, requesting authority to increase the gross shipping weight of household goods and personal effects of transferred employees from 5,000 to 8,000 pounds; disapproved April 30, 1921.

April 26, reporting favorably on bill S. 809 to give preference right of employment on construction work on irrigation projects to ex-service men; signed April 29, 1921.

April 27, recommending that authority be granted to execute a contract with the Cushman Ditch, Reservoir, and Fish Co., Uncompahgre project, under which the Reclamation Service will secure the Cushman ditch stock, resulting in elimination of the ditch and acquisition of the Cushman prior appropriation, giving the United States practically full control of all flood waters of Dry Creek; approved April 27, 1921.

April 27, reporting favorably on bill S. 491 to increase, without expenditure of Federal funds, opportunities for the people to acquire rural homes; signed May 5, 1921.

April 29, reporting, without recommendation, but as a matter of policy for the decision of Congress, on bill, H. R. 2916, providing for an investigation of the feasibility of the proposed Dubois project, Idaho, and appropriating \$100,000; signed May 12, 1921.

April 29, reporting favorably, with suggested amendments, on bill, H. R. 4596, providing for the disposal of so-called waste and drainage water at the lower end of the Rio Grande project, without incurring obligations for the delivery of any specified quantity of water at any future time; signed May 7, 1921.

Among the visitors to the Washington office during April were Maurice De Gove, ingénieur des Ponts & Chaussées; Eugène Touche, attaché au Service Central, de la Construction des Chemins de fer, de Paris à Lyon et à la Méditerranée, and Paul Feuilly, ingénieur de la Compagnie des Chemins de fer, de Paris à Lyon et à la Méditerranée, who are contemplating a brief trip through the West with the view to inspecting some of the larger dams of the Reclamation Service.

Reclamation fund transactions.

[Taken from Washington office books for the month of April, 1921.]

Balance of funds, from March report-----	\$1, 285, 930. 79
Net sales of public lands (Feb.)-----	179, 435. 32
Deposits by fiscal agents-----	285, 169. 01
Collections by auditor-----	34, 937. 76
Total accretions-----	1, 785, 472. 88
Withdrawals:	
Funds advanced to fiscal agents-----	\$56, 845. 09
Disbursements by auditor-----	73, 791. 76
Total withdrawals-----	930, 636. 85
Balance-----	\$54, 836. 03
Balances with fiscal agents-----	559, 279. 02
Net land sales for March, 1921-----	74, 411. 38
Oil-leasing receipts to be covered in-----	\$10, 430. 20
Estimated net April land sales-----	150, 000. 00
Estimated available-----	2, 448, 956. 63

Appropriation balances as shown by Treasury books,
May 13, 1921.

Blackfeet:	
1919-----	6, 982. 87
1920-----	2, 017. 35
1921-----	9, 303. 71
Flathead-----	173, 593. 59
Fort Peck:	
1919-----	36, 770. 32
1920-----	2, 135. 73
1921-----	3, 357. 79
Riverton:	
1919-----	1, 041. 36
1920-----	190. 64
Yuma auxiliary-----	230, 413. 20
Reclamation fund-----	\$77, 460. 00
Plus oil deposits available but not transferred-----	\$10, 430. 00
	887, 890. 00

Denver office.—The chief engineer returned from Yakima, Wash., on April 4, where a board of engineers met to consider matters pertaining to the con-

struction of the Tieton Dam. He left for Texas on April 23 to meet the director. The first project visited was the Lower Rio Grande. Assistant Chief Engineer C. P. Williams during April visited the Huntley, Lower Yellowstone, North Dakota pumping, Fort Peck, Milk River, Blackfeet, St. Mary Storage, and Sun River projects. Assistant Chief Engineer R. F. Walter returned to the Denver office on April 12, after visiting the Boulder Canyon work and the Strawberry Valley project. Official visitors included Messrs. Andrew Weiss, J. N. Beardslee, Richard Ward, Ferd Bonstedt, Walker R. Young, William M. Green, and D. C. Henny.

In the designing division the following specifications were prepared: Earthwork embankments, North Platte project; lock joint pipe forms, King Hill, North Platte, Yuma, Belle Fourche projects; cast-iron gates and gate hoists, Klamath project; detailed designs for chute drops and minor structures, Belle Fourche project; preliminary designs and estimates for Boulder Canyon Dam, including details for spillway and outlet works; design modification of siphon spillway and minor structures, King Hill project; specifications for Lower Lost River diversion dam, gates, etc., Klamath project; design of main canal check, Lower Yellowstone project; designs and studies for final plans, Connolly Dam, Milk River project; revised designs for structures, Fort Laramie main canal, North Platte project; designs for Wind River diversion dam and highway bridge, Riverton project; design for fishway Three Mile Falls Dam, and preliminary design for McKay Creek Dam. Umatilla project; revised design and estimates for Tieton Dam, to conform to findings of board of engineers; compilation of cost data, Yakima-Tieton project; revised design for minor structures, and specifications for purchase of cast-iron gates, B lift spillway, Yuma auxiliary project; maps and drawings for report on Colorado River investigations, and map of Lonesome Lake and Marias River Reservoir sites for use in connection with lease of land, Marias project. Work was continued on the standardization drawings for lock joint concrete pipe and forms.

The principal work accomplished in the electrical division consisted of the preparation of drawings for the crane runway, Ballantine auxiliary pumping plant, Huntley project; preliminary designs and specifications for the direct pumping plant, Lower Yellowstone project; drawings of interconnection substations, Minidoka project; estimates for use of board of engineers in connection with Spanish Springs Reservoir and inlet power plant, Newlands project; working drawings of the Robinson Flat substation, Okanogan project; building details for balanced needle valves and valve house for Shoshone power plant, and drawings showing tunnel lining reinforcement, Shoshone project, and preliminary studies and preparation of power curves relative to Government power plant for American Falls, Snake River Basin.

The principal work in the legal division consisted of consideration of the five damage cases arising from storm in Lake Tahoe in 1916, which cases will probably be tried the latter part of May, and the Yuma Water Users' case, which is set down for argument before the Circuit Court of Appeals, Ninth Circuit, on May 6. Plans for taking over operation and maintenance of the King Hill project and of the Notus division, Boise project, were completed. Eighty-five contracts and deeds were prepared or approved.

ADMINISTRATIVE ORGANIZATION.

DEPARTMENT OF THE INTERIOR.

Hon. ALBERT B. FALL, Secretary of the Interior.

EDWARD C. FINNEY, First Assistant Secretary.

FRANCIS M. GOODWIN, Assistant Secretary.

CHARLES D. MAHAFFIE, Solicitor for the Interior Department.

CHARLES V. SAFFORD, Administrative Assistant to the Secretary.

CHARLES W. NESTLER, Administrative Assistant to the Secretary.

HARRY G. CLUNN, Private Secretary to the Secretary.

JOHN HARVEY, Chief Clerk and Superintendent of Buildings.

U. S. RECLAMATION SERVICE.

WASHINGTON, D. C.

Arthur Powell Davis, director; Morris Blen, assistant director; Ottamar Hamele, chief counsel; J. B. Beadle, director's assistant; C. J. Blanchard, statistician; Hugh A. Brown, editor and office assistant; C. A. Bissell, engineer; A. H. Guillickson, chief accountant; Miss H. A. Feliows and Raymond Depue, fiscal agents; C. H. Fitch, chief clerk; Emmet Carr, purchasing agent; G. W. Numbers, appointment clerk; H. N. Bickel, Yakima, Wash.; W. A. Meyer, Denver, Colo., and W. F. Kubach, Great Falls, Mont., examiners of accounts.

DENVER, COLO.

F. E. Weymouth, chief engineer, Tramway Building, Denver, Colo.; R. F. Walter and C. P. Williams, assistant chief engineers; Miss L. H. Meisel, secretary to the chief engineer; J. M. Gaylord, electrical engineer; J. L. Savage, designing engineer; James Munn, consulting engineer; J. L. Burkholder, drainage engineer; W. L. Drager, office engineer; J. M. Luney, chief clerk; A. McD. Brooks, purchasing agent; Harry Caden, special fiscal agent.

FIELD LEGAL OFFICES.

Boise, Idaho.—B. E. Stoutemyer, district counsel. Projects: Boise, Mindoka, King Hill, and Jackson Lake Enlargement; R. M. Patrick, district counsel located at American Falls, Idaho.

Denver, Colo.—Law section office of chief engineer: E. E. Roddis and Armand Offutt, district counsel; J. J. Buck, assistant district counsel.

El Paso, Tex.—P. W. Dent, district counsel. Projects: Rio Grande, Carlsbad, and Hondo.

Helena, Mont.—W. J. Egleston, district counsel. Helena, Mont. Projects: Blackfoot, Flathead, Fort Peck, Huntley, Milk River, St. Mary Storage, Sun River, North Dakota Pumping, Lower Yellowstone, and Shoshone.

Mitchell, Nebr.—J. N. Beardslee, district counsel. Projects: North Platte and Belle Fourche.

Montrose, Colo.—J. R. Alexander, district counsel. Projects: Grand Valley, Uncompahgre Valley, and Strawberry Valley.

Portland, Oreg.—H. L. Hoigate and D. G. Tyree, district counsel. Projects: Yakima, Okanogan, Umatilla, and Klamath.

San Francisco, Calif.—Henry A. Cox and A. B. Fullerton, district counsel, 349 Pacific Building. Projects: Salt River, Yuma, Orland, and Newlands.

PROJECT ORGANIZATION.

Belle Fourche Project.—B. E. Hayden, project manager, Newell, S. Dak.; R. C. Walber, chief clerk; August Lewin, fiscal agent.

Boise Project.—J. B. Bond, project manager, Boise, Idaho; C. C. Fisher, engineer; E. R. Mills, chief clerk; C. F. Weinkauf, fiscal agent.

Carlsbad Project.—L. E. Foster, project manager, Carlsbad, N. Mex.; V. L. Minter, chief clerk and fiscal agent.

Grand Valley Project.—S. O. Harper, project manager, Grand Junction, Colo.; A. W. Walker, engineer; G. H. Murphy, chief clerk; A. H. Hall, fiscal agent.

Huntley Project.—A. R. McGinness, project manager, Ballantine, Mont.; G. H. Bolt, chief clerk; Miss M. C. Simek, fiscal agent.

King Hill Project.—Walter Ward, project manager, King Hill, Idaho; T. W. Hause, chief clerk; L. D. Eakin, fiscal agent.

Klamath Project.—H. D. Newell, project manager, Klamath Falls, Oreg.; N. G. Wheeler, chief clerk; G. R. Barnhart, fiscal agent.

Lower Yellowstone Project.—L. H. Mitchell, project manager, Savage, Mont.; C. A. Denman, chief clerk.

Milk River Project.—G. E. Stratton, project manager, Malta, Mont.; E. E. Chabot, chief clerk; G. S. Moore, fiscal agent.

Mindoka Project.—Barry Dibble, project manager, Burley, Idaho; Dana Tempin, engineer; E. C. Diehl, chief clerk; Miss A. J. Larson, fiscal agent; F. A. Banks, engineer, American Falls, Idaho.

Newlands Project.—J. F. Richardson, project manager, Fallon, Nev.; G. B. Snow, chief clerk and fiscal agent.

North Dakota Pumping Project.—W. S. Arthur, project manager and chief clerk, Williston, N. Dak.; H. C. Melaa, fiscal agent.

North Platte Project.—Andrew Weiss, project manager, Mitchell, Nebr.; H. W. Bashore, engineer, Fort Laramie Unit; Paul Roth, irrigation manager; J. R. Ummel, chief clerk; Miss A. L. Perrine, fiscal agent.

Okanogan Project.—Caivin Casteel, project manager, Okanogan, Wash.; W. D. Funk, chief clerk and fiscal agent; H. J. Gault, engineer, Conconully, Wash.

Orland Project.—A. N. Burch, project manager, Orland, Calif.; E. T. Eriksen, engineer; C. H. Lillingston, chief clerk and fiscal agent.

Rio Grande Project.—L. M. Lawson, project manager, El Paso, Tex.; T. W. Parry, irrigation manager; C. A. Peavey, chief clerk; L. S. Kennicott, fiscal agent.

Riverton Project.—H. D. Comstock, project manager, Riverton, Wyo.; R. M. Conner, engineer; G. H. Baird, chief clerk; J. C. Thrallkill, fiscal agent.

St. Mary Storage Unit.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk; H. E. Bruce, fiscal agent.

Salt River Project.—Being operated by the Salt River Valley Water Users' Association; C. C. Cragin, general superintendent and chief engineer, Phoenix, Ariz.

Shoshone Project.—J. S. Longwell, project manager, Powell, Wyo.; J. R. Iakisch, engineer; C. M. Jump, superintendent of irrigation; W. F. Sha, chief clerk; C. M. Wresell, fiscal agent.

Strawberry Valley Project.—W. L. Whittemore, acting project manager, Provo, Utah; J. E. Overlade, chief clerk and fiscal agent.

Sun River Project.—G. O. Sanford, project manager, Great Falls, Mont.; H. W. Johnson, chief clerk; Miss M. G. Valentine, fiscal agent; G. A. Benjamin, irrigation manager, Fairfield, Mont.

Umatilla Project.—H. M. Schilling, project manager, Hermiston, Oreg.; M. D. Scroggs, superintendent of irrigation; G. C. Patterson, chief clerk and fiscal agent.

Uncompahgre Project.—L. J. Foster, project manager, Montrose, Colo.; A. H. Peach, chief clerk and fiscal agent.

Yakima Project.—J. L. Lytel, project manager, Yakima, Wash.; C. E. Crowmover and C. F. Gleason, engineers; R. K. Cunningham, chief clerk; J. C. Gawler, fiscal agent; J. G. Heinz, engineer, Sunnyside, Wash.; J. S. Moore, superintendent of irrigation, Naches, Wash.; F. T. Crowe, engineer in charge construction Tieton Dam, Rimrock, Wash.

Yuma Project.—P. J. Preston, project manager, Yuma, Ariz.; R. M. Priest, superintendent of construction; E. R. Schepplmann, chief clerk; E. M. Philebaum, fiscal agent.

INDIAN PROJECTS.

Blackfeet Project.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk and fiscal agent.

Flathead Project.—C. J. Moody, acting project manager, St. Ignatius, Mont.; J. M. Swan, chief clerk; J. P. Siebenelcher, fiscal agent.

Fort Peck Project.—S. A. Kerr, project manager, Poplar, Mont.; Henry Berryhill, chief clerk and fiscal agent.



Rio Grande Project Office Employees. (For key, see page 280.)

The Reclamation Record

ISSUED MONTHLY BY THE RECLAMATION SERVICE
DEPARTMENT OF THE INTERIOR, WASHINGTON, D. C.

Better Farming : Better Business : Better Living

THERE CAN BE NO SURE INSURANCE FOR THE NATION THAN TO PUT ITS MEN UPON THE SOIL

VOLUME 12, No. 7

PRICE ^{FREE TO OUR WATER USERS}
^{SEVENTY-FIVE CENTS A YEAR TO OTHERS}

JULY, 1921



A FLOCK ON EVERY FARM.



KLAMATH PROJECT OFFICE AND EMPLOYEES.

Left to right: E. C. Koppen, engineer; Gus G. Johnson (resigned); Geo. R. Barnhart, Clerk; W. A. Meyer (now examiner of accounts); E. V. Hillius, clerk; Herbert D. Newell, project manager; W. L. Smith, assistant engineer; Geo. G. Fry, superintendent of irrigation.



ORLAND PROJECT EMPLOYEES.

Left to right: A. N. Burch, project manager; E. R. Asdell, instrumentman; Verona Sperlich, stenographer; May M. Schuler, under clerk; H. W. Emery, timekeeper; C. H. Lillingston, chief clerk; R. C. E. Weber, engineer.

RESULTS OF IRRIGATION BY THE RECLAMATION SERVICE.

THE works of the Reclamation Service in 1920 served areas aggregating about 2,775,000 irrigable acres, including 1,675,000 acres for which the Government systems furnished the sole supply of irrigation water and 1,100,000 acres to which in most cases the service furnished stored water in bulk to supplement the partial supply of private systems otherwise dependent on unregulated stream flow. Of the first class, 1,225,000 acres were actually irrigated and 1,156,000 harvested. Of the other class, from less complete information it is roughly estimated that 950,000 acres were irrigated and 913,000 cropped.

As suggested by the foregoing, the lands served by the works built under the Federal reclamation law may be conveniently considered as of two classes. The first comprises lands for which the United States, under the reclamation act of June 17, 1902, has in general built a complete system of irrigation works from the point of storage to that of delivery to each farm or group of farms. These are the lands commonly referred to as included in the Government projects and include those tracts that under Government aid have been converted from sagebrush to productive farms. The other class of lands benefited by the Government works includes those served under the Warren Act of February 21, 1911 (36 Stat., 925). This important supplement of the reclamation act provides a connecting link between the Government works and private systems built in the same vicinity or drainage basin. The latter commonly lack storage, depending originally on the unregulated flow of the streams alone. This natural flow often declines in the irrigation season to a point far below the needs of all the constructed canals, and the typical case of service to such canals and lands from the Government works involves furnishing stored water at such times from the reservoirs built by the Reclamation Service. This may be simply delivered in bulk in the river channel, or the service may include carriage through other Government works and delivery at various stages of the process of distributing water to the individual farms. Similarly, the quantities of water made available by the Government works in such cases vary from a complete supply to a small percentage of the total used by the irrigators. Even where only a portion of the total water used is furnished, it may be a vital part, and may double the crop yield that would otherwise be secured.

PRODUCTIVITY OF RECLAIMED LANDS.

The arid lands when irrigated are intensively cultivated and yield large crops. In general it may be roughly stated that the gross crop values on the Government reclamation projects average double those

for the United States as a whole. This is indicated by the census figures in Table 1.

TABLE 1.—Average crop values per acre.

Year.	All United States. ¹	Government reclamation projects. ²
1910.....	\$15.53	\$30.00
1911.....	15.26	28.00
1912.....	15.63	25.00
1913.....	16.36	24.50
1914.....	16.36	23.50
1915.....	16.88	24.00
1916.....	22.10	33.25
1917.....	32.44	58.40
1918.....	32.92	63.60
1919.....	36.33	79.90
1920.....	23.44	58.80

¹ Source: Bureau of Crop Estimates, United States Department of Agriculture. Figures after 1918 are for 10 crops combined, which comprise nearly 90 per cent of the area in all crops, and the average value of which closely approximates that for all crops.

² Source: Annual Reports, United States Reclamation Service. Figures refer to lands on Government projects proper.

It will be noted that in 1910 the ratio was just about 2:1, and in 1920 the ratio was well over 2:1, in favor of the Government project lands.

Between these years the ratio first declined and then increased. While the average for the United States was slowly increasing from 1910 to 1915, that for the Government projects was gradually declining. This was due to the fact that the Government works began delivery of irrigation water to a substantial nucleus of well-developed lands that had been under irrigation from private canals for a number of years. The Government works furnished a better supply to these lands, and also brought in large areas of new, raw lands. These raw lands during the first year or two did not attain full production, and this factor was sufficient during the period mentioned to bring down the average return per acre.

The extension of the Government projects continues to bring in such raw lands each year, but the relative weight of this factor becomes less and less each year, and thus with the great increase in prices the curve of average gross crop value for the Government projects turned upward in 1915, and has since increased more rapidly than that for the United States as a whole.

CROP VALUES.

Since the Government works began delivery of irrigation water the crops produced on the reclaimed lands have exceeded \$400,000,000 in value. This includes nothing for the large areas served under the Warren Act and does not include increased values produced as live stock and stock products.

For the lands on what may be called the Government projects proper, as defined above, a crop census

for 1920 showed a gross crop value of about \$68,000,000, or nearly \$59 per acre for the 1,156,000 acres harvested (Table 2). As already stated, these data are subject to some revision. The figures refer to lands for which the Government works are the sole source of irrigation water and the control of the Reclamation Service commonly extends throughout the system of lateral canals that deliver water to each farmer. Thus, the service has a force of ditch riders in frequent touch with the irrigators. This provides a ready means of gathering census data of more than ordinary accuracy and at little or no extra expense, since the time for collecting these coincides with that when the water deliveries are dwindling in the fall. The ditch riders, though still required for occasional deliveries, have at that time less onerous duties than during the height of the irrigation season in connection with the operation and protection of the works.

The census reports thus secured for 1920 covered an irrigated area of 1,225,000 acres and 1,675,000 acres that were irrigable; that is, for which the works were prepared to supply water.

The difference between the areas irrigated and cropped, i. e., the acreage irrigated in 1920 but producing no crop that year, includes young fruit trees short of bearing and alfalfa seeded in the fall.

The larger difference between irrigable and irrigated areas does not indicate a failure to utilize 450,000 acres and the water ready for it. A part of this balance on a few of the most easterly projects is cultivated or pastured without irrigation, often combining such operations with the more intensive ones of irrigation on the same farms. Another portion of this balance is public land that, though under ditch, is temporarily withheld from settlement for a seasoning of canals or other action preliminary to inviting in farmers. A small part is public land awaiting entry. Other tracts are State, railroad, or Indian lands more or less in process of subdivision and settlement.

But the largest part of the unirrigated land for which water is ready comprises a great number of small pieces of the irrigated farms. Thus, the figure given as irrigable agrees with the official farm unit plats and is the total area on which water charges are based, but necessarily a part of this is taken up by the farmers' ditches, buildings, and roads, so that it can not be cultivated. On this account the most complete use of the irrigable area to be ultimately expected will show the irrigation of from 80 to 90 per cent. Also, the new settler of ordinary means can not put his whole unit to use the first year, nor the second, but gradually adds to the area graded, cultivated, and irrigated. For this reason the irrigated area lags behind the irrigable, both increasing each year as new farms are brought under the extended canal systems and the older ones progress toward complete cultivation.

TABLE 2.—*Irrigation and crop results, Government reclamation projects, 1920.*¹

[Subject to correction.]

State and project.	Lands on projects proper covered by crop census. ²			
	Irrigated acreage.	Cropped acreage. ³	Crop value.	
			Total.	Per acre.
Arizona:				
Salt River ⁴	205,060	193,350	\$18,551,800	\$96.00
Arizona-California:				
Yuma.....	54,550	54,480	3,770,940	69.20
California:				
Orland.....	13,870	11,040	549,700	49.80
Colorado:				
Grand Valley.....	11,730	10,760	525,360	48.80
Uncompahgre.....	64,180	63,730	3,397,500	53.30
Idaho:				
Boise.....	109,760	160,700	4,653,400	46.20
King Hill ⁵	4,780	4,520	216,500	47.90
Minidoka—				
Gravity division ⁷	61,520	55,640	2,274,400	40.90
Pumping division.....	46,130	42,940	2,445,700	57.00
Montana:				
Huntley.....	20,020	20,020	543,780	27.10
Milk River ⁸	24,330	22,330	332,200	14.90
Sun River—				
Fort Shaw division ⁹	8,050	8,400	256,450	30.50
Greenfields division ¹⁰	6,730	7,950	136,350	17.10
Montana-North Dakota:				
Lower Yellowstone... ¹¹	19,120	19,120	584,700	30.60
Nebraska-Wyoming:				
North Platte—				
Interstate division	88,000	86,920	4,043,600	46.50
N. P. C. & C. Co. lands.....	9,630	9,370	382,500	40.80
Fort Laramie division.....	8,530	8,490	253,180	29.80
Northport division.....	1,250	1,220	27,170	22.26
Nevada:				
Newlands.....	45,610	44,570	1,686,400	49.80
New Mexico:				
Carlsbad.....	22,170	20,180	895,300	44.40
New Mexico-Texas:				
Rio Grande.....	82,960	77,880	4,639,200	59.60
North Dakota:				
North Dakota pumping.....	2,810	2,740	86,780	31.70
Oregon:				
Umatilla.....	12,030	10,190	519,470	60.00
Oregon-California:				
Klamath.....	38,100	35,260	904,500	25.60
South Dakota:				
Belle Fourche.....	59,850	59,850	832,200	13.90
Utah:				
Strawberry Valley....	32,350	29,250	1,945,900	66.50
Washington:				
Okanogan.....	5,440	4,920	431,200	87.70
Yakima—				
Sunnyside division.....	93,610	78,940	8,330,400	105.50
Tieton division....	28,000	27,250	3,471,400	127.40
Wyoming:				
Shoshone—				
Garland division..	35,190	34,850	929,100	29.70
Frannie division..	10,460	9,270	134,540	16.34
Total.....	1,225,820	1,156,130	67,751,620	58.80

¹ Data are for calendar year (irrigation season), except on Salt River project data are for corresponding "agricultural year," October, 1919, to September, 1920.

² In addition areas aggregating 1,000,000 acres were served water from the Government works, usually stored water sold in bulk under the Warren Act to supplement private rights.

³ Irrigated crops. Excludes small areas on few projects cropped by dry farming.

⁴ Data furnished by Salt River Valley Water Users' Association, which operated the project.

⁵ Includes 5,536 acres reported as vacant, 3,032 acres of "home tracts," and 3,146 acres within town sites, on which no crop was reported.

⁶ Data furnished by King Hill irrigation district, which operated the project. This was built under private auspices and is under reconstruction by the United States.

(Additional footnotes at bottom of column 1, page 301.)

VALUE OF PROPERTY CREATED BY PRESENT INVESTMENT.

Full statistics are not available to show the values created by the Federal reclamation work. It is known that aside from the agricultural products large values have been created directly by the Government work and indirectly by related investments of others based on such work. It has been estimated, for example, that where the Government spends a dollar in irrigation, from \$5 to \$10 are invested by the farmers and industries that are brought into being in the new communities.

The direct increase in land values has been enormous. This is illustrated by the frequent sales of the irrigated lands at high prices. Such prices are commonly reported at \$200, \$300, or \$400 per acre, and in the case of well-improved lands have in rare instances reached as high as \$1,000 or \$1,500 an acre. On the basis of productivity the lands most desert were well-nigh worthless, and large areas in the Government projects were held at \$10 or less before the advent of the Reclamation Service. While precise figures are impossible, it is roughly estimated that Government irrigation has increased the value of the project lands \$200 per acre on the average, or a total of over \$350,000,000; that it has increased the value of 1,000,000 acres in other projects served under the Warren Act by \$100 per acre, or a total of \$100,000,000. The increase in the value of lands in the cities, towns, and villages within the projects is believed to exceed \$100,000,000, making a grand total increase in land values alone of over half a billion dollars, due to the Government work.

In the foregoing, no allowance has been made on account of 1,000,000 or more acres the irrigation of which is contemplated upon the completion of the projects in hand and the present market price of which has increased at least \$50 per acre by reason of that fact.

The increase in the price received for State lands included in the projects and now mostly disposed of was at least \$3,000,000 of direct revenue derived by the States.

RETURN OF MONEY TO RECLAMATION FUND.

The Federal reclamation law contemplates the return to the United States of the costs for constructed

projects. These costs are charged against the lands benefited and repaid in small instalments. In other words, the reclamation fund is a revolving fund.

On the going projects the expenditures and the resulting charges against the farmers may be conveniently classed under two heads, viz, those charged to construction accounts, and, secondly, the expense for the annual operation and maintenance of the works.

The reclamation act of 1902 contemplated the return of the construction charge for any particular farm unit in a repayment period of 10 years after issuance of a public notice announcing the charge. By the extension act of 1914 this period was doubled and a schedule of percentage payments fixed in a way intended to facilitate the establishment of the settler on a going basis and enable him to repay the project cost in easy terms from the crop values taken from the irrigated land. In the main the irrigators are keeping well up in their payments thus prescribed by law and public notice. To June 30, 1920, a total of \$8,965,000 had been repaid into the reclamation fund in construction charges. On that date there were due \$9,421,000 in such charges, so that only \$456,000, or 5 per cent of the accrued charges, were unpaid, although the law gives the settler considerable time after any payment is due before he is sufficiently in default for nonpayment to require that he be delivered no more irrigation water.

The annual expense for operation and maintenance is largely a yearly turnover of funds; that is, it is represented by an annual operation and maintenance charge, which under the reclamation extension act must be fixed at an amount estimated to return the full cost of each year's operation. On June 30, 1920, operation and maintenance charges had aggregated \$7,094,000, of which \$6,275,000 had been collected.

RECLAMATION FUND LOSSES.

Although the reclamation fund is a revolving fund it is a necessary inference from the law that some expenditures are to be made from the fund without certainty of return; in fact, that there will be some losses to the fund.

Thus the law necessarily provides for the study and survey of projects before their adoption and construction. Obviously some of the projects will be found infeasible, in which case there is no means of collecting the expense of the investigation. This may well amount to many thousands of dollars on a particular project, and to date the Reclamation Service has an investment of upward of a million dollars in such investigations for which there is at present no assurance of return. If these projects are later adopted for construction the costs of investigation will be included in the charges to be repaid.

(Additional footnotes to Table 2, page 300.)

⁷ Data furnished by Minidoka irrigation district, which operated the division.

⁸ Crop reports covered an additional area of 12,760 acres cropped by dry farming, producing crops worth \$102,500, or \$8 per acre.

⁹ Figures are for 203 irrigated farms, which included small tracts farmed without irrigation. In addition 3 units farmed "dry" reported a value of \$900 from 45 acres pastured or cropped.

¹⁰ Figures are for 151 irrigated farms, which included small tracts farmed without irrigation. Pending construction of storage a full water supply is not available.

¹¹ For crops in full production, excluding 9,720 acres of wild grass pasture and 4,759 acres otherwise not in full production. For all crops, \$37.80.

In the case of constructed works, no provision is made for a profit on any particular project. Thus each project must stand by itself and the loss that may result on a relatively poor project can not be recouped on the most successful, as would be done in ordinary commercial practice, although the more successful projects could well stand the increase of charge that would result. Also where public notice is issued fixing the charge per acre on a completed project, if some of the acreage is later lost by water-logging or other cause the law provides no method for transferring this small portion of the cost to other lands. In fact, the reclamation extension act specifically prohibits an increase in the charge announced by public notice except with specific approval of the water users.

In the business world any undertaking that can not make a profit will almost certainly show a loss, and this is the rule under which the Secretary of the Interior must administer these numerous large projects if we consider dollars and cents in the reclamation fund alone. In the administration of the reclamation law for 20 years and the investment of upward of \$120,000,000 from the reclamation fund, it is now estimated that about \$5,000,000, or less than 5 per cent, are chargeable to the several items suggested above for which there is no return in sight.

In a broader sense, against this loss to the fund may be set down the new wealth exceeding a half billion dollars and the large annual crop values that have resulted from effort based on the investment of the reclamation fund.

IRRIGATION HAS HELPED MATERIALLY TO PRODUCE THESE RESULTS.

Shoshone Project, Wyoming.

By J. S. Longwell, Project Manager.

TO DECEMBER 31 1920.

Work was first undertaken on the Shoshone project in 1903, the first irrigation taking place in 1908. The development of the project, as shown in the following tabulation, resulting from the construction of the irrigation works, has thus taken place since 1908. Up to the end of the year 1920 there had been spent on irrigation and drainage works \$6,415,058, a portion of which is chargeable to future units of the project. Water will be available for 71,000 acres in 1922. The full development of the project will, including Oregon Basin, bring under water approximately 225,000 acres.

The accompanying data, showing the results of farming operations to the end of 1920, show the rapid development of the project and give an idea of what may be expected from the development of the entire project as proposed.

Values created.

Value of farm lands and improvements on project estimated by owners, end of 1920	\$7,346,000
Value of live stock	600,000
Value of farm equipment	415,000
Total	8,361,000

Assessed valuations.

Farms	\$3,639,000
Towns	708,000
Public utilities	60,000
Total	4,407,000

Value of crops produced in 1920.

Alfalfa	\$348,256
Wheat	277,990

Value of crops produced in 1290—Continued.

Sugar beets	\$163,104
Potatoes	80,273
Oats	75,344
Pasture	43,733
Clover seed	33,624
Gardens	29,290
Barley	8,306
Miscellaneous	6,500
Oat hay	2,180

Total	1,063,600
Value of crops produced since 1910 (actual census)	7,482,700

Shipments of agricultural products, 1920.

Alfalfa hay	cars	501
Sugar beets	do	325
Alfalfa meal	do	184
Straw	do	149
Potatoes	do	93
Wheat	do	93
Cattle	do	25
Sheep	do	18
Hogs	do	17
Wool	do	7
Honey	do	2
Sweet clover seed	do	1

Total	do	1,415
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Wholesale purchases from manufacturers during 1920.

Groceries	\$297,400
Automobiles, trucks, etc	257,000
Lumber	223,100
Coal, feed, and bags	183,600
Dry goods, clothing, shoes, etc	159,400
Hardware	113,500
Drugs and sundries	51,500

Wholesale purchases from manufacturers during 1920—Continued.

Farm implements.....	\$46,500
Furniture.....	35,000
Machinery and supplies.....	17,800
Cigars, etc.....	13,650
Jewelry and miscellaneous instruments.....	7,000
Other merchandise.....	15,000
Total.....	1,420,450

War activities of the project.¹

Men in Army.....	199
Men in Navy.....	8
Red Cross members.....	1,000
Liberty loans.....	\$312,000
Red Cross subscriptions.....	\$15,000
Subscriptions to other activities.....	\$10,000

Other significant statistics, 1920.

Number of farms.....	1,009
Number of towns.....	5
Population.....	5,415
Acres supplied with water.....	45,635
Acres in crop.....	44,110
Public schools.....	12
Churches.....	9
Hospitals.....	1
Newspapers.....	3
Banks.....	6
Capital stock.....	\$125,000
Deposits.....	\$645,000
Number of depositors.....	2,605
Industries:	
Grain elevators.....	3
Alfalfa mills.....	2
Potato warehouse.....	1
Beet dumps.....	6
Town water supplies.....	2
Railroads.....miles.....	37

¹ Conservative estimates, as actual figures are not available.**Sunnyside Division, Yakima Project.**

By J. L. Lytel, Project Manager.

YEAR OF 1920.

Total cost of division to date.....	\$4,032,000
Total acreage for which water is available.....	100,130
Number of farms.....	2,905
Owners, including entrymen.....	2,272
Tenants.....	633
Number of towns.....	11
Population of farms.....	10,929
Population of towns.....	6,941
Average population on farms.....	4
Acreage irrigated.....	93,610
Acreage cropped.....	78,936
Public schools.....	40
Banks:	
Capital and surplus.....	\$815,400
Amount of deposits.....	\$5,455,803
Crops and returns:	
Alfalfa.....	\$3,096,784
Apples.....	2,342,486
Barley.....	22,245

Crops and returns—Continued.

Beets, sugar.....	\$239,070
Corn.....	216,889
Corn silage.....	32,520
Corn fodder.....	14,910
Fruits, small.....	110,700
Garden.....	452,600
Hay (except above).....	45,930
Hops.....	75,190
Oats.....	12,342
Onions.....	5,780
Pasture.....	116,160
Peaches.....	16,891
Pears.....	185,703
Potatoes.....	838,802
Prunes.....	113,462
Rye.....	2,553
Wheat.....	389,377

Total..... ¹8,330,394
Average per acre..... 105.53

Live stock.....	1,818,210
Equipment.....	1,029,999
Automobiles (2,357).....	1,437,568
Silos (270).....	48,612
Value of improved lands and lots.....	17,138,240
Improvements.....	3,400,000
Assessed valuation, farms and lots.....	8,500,000
Assessed valuation, improvements.....	1,700,000

¹ 1920 returns show a total decrease of \$4,347,853 over the bumper figures of 1919, with an increase of 3,050 acres of cropped land, owing to lower prices for farm products. Hops gave highest yield per acre in 1920, prunes taking second place for first time in five years, owing to damage from extreme cold of previous winter.

BULLETINS FOR THE FARMER.

Distributed by the Department of Agriculture,
Washington, D. C.

FARMERS' BULLETINS.

No. 1145. Handling and transportation of cantaloupes.

No. 1213. Flag smut of wheat and its control.

ANDREW F. ROSS, 1864-1921.

With deep regret we record the death on May 8, 1921, of Andrew F. Ross, superintendent of construction in charge of repair work in the Strawberry tunnel, Strawberry Valley project. After about a week's illness Mr. Ross died at the Provo General Hospital of heart failure incident to bronchial pneumonia. He had been employed in the Reclamation Service for many years on difficult tunnel construction as well as on other important engineering work. His exceptional ability, patience, and forethought made his services extremely valuable, especially in difficult and trying situations. Mr. Ross is survived by a wife and daughter Annie, to whom the sympathy of the service is extended. His son Charles was killed in France in 1918 while serving with the A. E. F.



THE campaign initiated in 1919 in many States for "Better sires—Better stock" has been encouraged and stimulated by the Agricultural Department, which gives an emblem to every person who cooperates by filing an application and a list of his animals or poultry. The response to the appeal to improve our live stock has been gratifying, and emblems have even been sent to Porto Rico and Guam. Two widely separated States, Virginia and Nebraska, lead in the number of animals and poultry listed, the former with 31,765 animals and 64,013 poultry, and the latter a good second with 29,284 animals and 55,762 poultry. Montana is third, New Mexico fourth, and South Dakota fifth. Among the 22 States listed, four Western States are in the front ranks. Idaho's place is last, with only 1,059 animals and 461 poultry listed. The object of this movement is illustrated by a letter from an Elko County, Nev., stockman, who states: "My yearling steers go over the scales at from 1,200 to 1,225 pounds, while the ordinary Nevada scrub steers go out of the State weighing from 800 to 900 pounds." His steers, it is unnecessary to state, are from pure-bred sires.

During May and early June the requests for loans of reclamation films and slides were numerous. Flathead, Rio Grande, Snake River Valley, Idaho, Salt River, Yuma, Grand Valley, and Carlsbad reels were in circulation in Virginia, Ohio, and Indiana. A set of four reels containing the principal engineering structures of the service and numerous scenes illustrating the use of labor-saving machinery were assembled and delivered to the Czecho-Slovak Legation in Washington. The films will be taken this month to the new Republic of Czechoslovakia by Mr. Stanislav Spacek, engineer of the legation. Mr. Spacek will exhibit the pictures in connection with lectures he is planning to give in the universities and schools of his country. Dr. Bedrich Stepanek, envoy extraordinary and minister plenipotentiary of Czechoslovakia, Mr. Spacek, C. E., and Dr. Rudolf Kuráz, agricultural attaché, with other members of the legation, witnessed the projection of the films in the auditorium of the Department of the Interior and commented in flattering terms on the pictures. A scenario of the service, "Making the Desert Blossom," will soon be exhibited in France under the auspices

of the Chicago Tribune, which is planning a campaign in that country to educate our allies on America and her institutions.

Later we are hopeful that opportunity will be given to display our pictures in the leading ports of embarkation, where the alien homeseekers may visualize the wonders of the Golden West. Opportunities for such publicity already exceed our supply of available films.

It was but natural that the prices of farm lands throughout the United States should react to the slump in the prices of farm products. In the Southern States, where cotton is the principal crop, the decline in land prices reached a maximum of 30 per cent in some sections. Kentucky, owing to its large tobacco acreage and the unsettled market for this crop, suffered a decline in land prices of 24 per cent. In 1920 the average price for plow land was \$70 per acre, while this year it is \$53.

Iowa ranks first among the States in the price of plow land per acre. According to recent reports of the Agricultural Department the price declined from \$219 in 1920 to \$200 in 1921.

It is encouraging to note that the decline is not so marked in the arid States. In California, Colorado, and Oregon prices show a slight increase. In the State of California the increase was from \$130 per acre in 1920 to \$135 in 1921.

Land prices still continue higher than any previous year except 1920.

The assurance of crops from irrigation where lands are under a good system relieves us of any apprehension that marked declines in prices of these lands will take place. The West has grown away from the old boosting methods of selling, and the speculator is not in evidence as in the old days. Buyers have grown wise, and sales are made now on the basis of the producing capacity of the lands and not in the dreams of the real estate dealer.

Here and there in the West are landowners who persist in withholding large tracts in the hope of great appreciation, but the lack of sales and the piling up of charges against these lands must ultimately force them on the market at fair prices.

The summer period shows the usual lessening in the number of inquirers in our mail. There is no falling

off in the public's interest in the opening of new lands. September is always a big month in the settlement business in the Reclamation Service, and with a reduction in railway rates to the West, which now seems likely, we are looking forward to a healthy movement of land seekers this fall.

The tragedy of Pueblo and other parts of the Arkansas drainage basin emphasizes the importance of a more comprehensive study of our western rivers. While it is not probable that any works of man could have been devised wholly to obviate the appalling calamity which has wrought death and desolation to cities and countryside in this beautiful mountain region, the belief is general that reservoirs of ample capacity and rightly located would measurably have lessened the destructive forces of the floods and decreased the loss of human lives. The Arkansas and all its tributaries are erratic and flashy. Storage reservoirs would be of great benefit in these valleys, not only in preventing flood damage, but in supplying water for the irrigation of a large amount of land which is yet undeveloped. The losses in dollars and cents from this recent flood are estimated at more than \$25,000,000, and such losses are likely to occur again unless preventive means are discovered. An investment of only a portion of this vast sum surely would suffice for the development of a comprehensive system of storage reservoirs so situated as to catch and hold the peak of these floods.

Contrast the conditions existing to-day in the Arkansas Valley with those of the Rio Grande Valley below Elephant Butte Dam, or in North Platte Valley, Wyo.-Nebr., below the Pathfinder Dam. In these two valleys floods are welcomed and occasion no alarm, yet only a few years ago the spring floods caused heavy losses to the inhabitants and rendered farming precarious in many parts of each.

The headwaters of the Pecos were visited by unusual heavy rainfall during the Pueblo flood period, but the storage reservoirs of the Government checked the flow of water, and the ample spillways carried off the surplus so that no damage occurred to property in that district.

Among our visitors during the month were O. H. Baum, of El Paso, who has business before the War Department, and W. C. Larsen, president of the Snake River Valley Community Club, Paul, Idaho, who is seeking the transfer of the Hailey land office to Paul. Incidentally Mr. Larsen has been giving wide publicity to the valley by use of the motion films. W. G. Swen-tsen, commissioner of irrigation of Idaho, made a brief call and reported everything swinging back to normal in his State.

Arizona, Salt River project.—The following from the Philadelphia Ledger is a deserved compliment to the Salt River Valley and its farsighted citizens.

Maricopa County, Ariz., is putting itself on the map. It had a job to do and it is doing it. Phoenix is the county seat. Once the Maricopa region of the Salt River Valley was a desert waste, but it has blossomed like the rose since the building of Roosevelt Dam.

The people wanted roads just as Caesar did long ago, and the only way they could get them was to provide money for their building. They started in by floating a bond issue of \$4,000,000. This was for 141 miles of concrete highway. Before the work on that issue had more than started they decided to build 168 additional miles of road, making a total of 309. That's as much as some States have of first-class highways. For the additional 168 miles they have issued \$4,500,000 of bonds, making a total of \$8,500,000.

The Engineering News Record in its latest number gives a detailed technical description of how the work is proceeding. Apparently the county is getting a first-class job. Great progress is being made. Necessarily there was a bit of delay at the start. In the first four months of construction 32 miles of highway had been built. Now the contractors are laying more than 3,000 feet a day, or at the rate of about 13 miles a month. Soon they'll be working night and day.

It is planned to place every farmhouse in the valley within 1 mile of a paved highway. Main roads, of course, are of heavy construction, while laterals and other branch highways will be of lighter build.

California, Orland project.—Few Orland folks outside of those who are closely associated with the industry, have any idea of the growth of the egg and chicken business here during the past two years. Practically no one outside of Orland realizes that Orland is the Petaluma of the Sacramento Valley. Perhaps it is modesty on the part of the boosters, or a talk on almonds, oranges, and citrus cherries is more romantic than mere hen's eggs, but we'll tell the world that a shipment of 72,000 eggs in one day is some whale of a shipment. Just think of the angel food that would make.

That's Orland's egg-shipping record for one day, 6,000 dozen, or 200 cases of eggs.

Colorado, Uncompahgre project.—The potato acreage being planted in the Uncompahgre Valley is the largest in history, and estimates as to its comparisons with other years run from two to three times as much.

Already growers are beginning to wonder how they are going to ever get them picked and, worse than that, how they will ever get them to market.

Some growers, however, believe there will be plenty of pickers this fall. As an example of how growers are doubling their acreage, Gus Scharf put out 100 acres; Chas. Tappan, 80 acres; and so it goes. Those in the habit of planting 5 acres have made it 10 to 15 this year. Those who ordinarily grow 20 to 25 acres, have made it 50 acres.

One thing is in favor of the growers and that is the drop in sack prices. Many growers recently purchased their sacks at 6½ cents each, which is some comedown from recent prices of 20 to 25 cents each.

One reason for the large spud acreage is the gambling feature. Wheat and oats do not look good for

remunerative returns. Many have turned to spuds as a sort of gamble. If they are high, the grower makes good money. If low, he makes nothing. They simply take a chance. Low seed also was a commanding feature favorable to heavy planting.

It now appears that the orchardists and other people of Montrose County stand a good chance to make from a half million to two-thirds of a million dollars this year from fruit.

Of that large sum it is estimated that the growers, railroads, and speculators will get 60 per cent, while the pickers, packers, haulers, and dealers in boxes and wrappers will get about 40 per cent. That means that something over \$100,000 will go to the women and girls, boys and men who do the picking and packing and who will immediately put the money into circulation. The money so spent will be felt beneficially in business circles early in the fall.

From the best information obtainable there is a large crop of apples on the trees. It was thought early in the spring that some early varieties had been injured, but as the young apples are becoming large enough to permit dependable observation it is becoming more and more apparent that there is no appreciable loss.

Everything considered, the orchardists are extremely optimistic about the chances of a large yield and of good prices.

Idaho, Boise project.—Fifty-three leading poultry raisers in Canyon County attended the recent meeting in the Caldwell Commercial Club to discuss the advisability of forming a poultry marketing association. Pren Moore, State poultry specialist, outlined the general program and purpose of the meeting, after which Paul Mehl, marketing specialist of the Oregon Agricultural College, delivered an address on the principles of cooperative marketing as applied to poultry.

Mr. Mehl discussed the poultry marketing associations in California, Washington, and Oregon. Following his talk an expression was obtained as to the advisability of organizing and affiliating with the Oregon association. U. L. Upson, manager of the Pacific Cooperative Poultry Producers' Association, extended, through Mr. Mehl, the invitation to the Idaho producers to become affiliated with the Oregon association.

One man was appointed in each community in the county to represent the Canyon County farm bureau in making a poultry survey to determine the actual number of hens in the flocks of the county. This report will be made to C. H. McCandless, poultry project leader of the bureau. Later committees that were appointed in Boise, representing the counties of Lower Snake River Valley, will meet at Caldwell and complete plans for organizing the association.

Plans for the organization of cooperative marketing associations to handle agricultural produce were worked out at a meeting of the executive board of the Idaho Farm Bureau Federation in the opening sessions of its three-day convention at the Owyhee Hotel recently. Approximately 60 persons attended.

A resolution was drafted by a general committee outlining the fundamental principles of cooperation, upon which it was decided to form marketing associations for various commodities.

The following cooperation recommendations were accepted by the federation:

The first fundamental to successful marketing is to organize on a commodity basis.

In order to determine a justification of the respective organizations, a survey of the amount, location, and classification of the commodity should be obtained.

Facilities for assembling, storing, and shipping should be determined.

Organization should be perfected to eliminate diversified and adverse interests: (1) Confine membership to producers of the commodity to be organized; (2) the governing board to be actual producers; (3) each member shall have only one vote.

Selling agencies should be organized on a non-profit, noncapital-stock basis. There should be a long-time contract, and the amount of the commodity to be pooled should be left to each organization.

The various commodity organizations should form a finance corporation so none of the cooperative organizations suffer from inadequate finances.

A service department, for the purpose of gathering and distributing information relative to respective commodities, should be established.

It is recommended that the executive committee of the State farm bureau take such steps as are necessary to affiliate the various commodity organizations with the interstate and national organizations for these various commodities.

Idaho, Minidoka project.—Mr. F. C. Graham, cheese maker at the Rupert factory, reports that he is handling an average of 4,000 pounds of milk daily, which is not nearly up to the full capacity of the plant. This quantity of milk produces 400 to 450 pounds of cheese. The product is held as long as possible for it to age, but is being shipped at an average of about 3,500 pounds per week.

Rupert cheese is gaining quite a reputation, and a letter was received from the wholesaler at Seattle in which the statement was made that this product ought to bring a few cents more than the market price because of its quality. The benefits which would accrue if the above statement becomes a fact may be realized in the future if the good work is kept going.

The reputation of Rupert cheese is evidenced by the fact, already known to some people, that last season it received four first prizes out of six exhibits, securing second at the State fair, the loss of first place being occasioned by half of one point.

Dairying is being urged as the industry which will put the Minidoka project on the map of successful farming, and although there are times when the

farmer probably thinks it foolish to consider the buying and milking of cows, taken as a whole it will win in the end. Butter fat has its ups and downs in price, but those who have studied the situation closely are strong in the belief that it is the best thing for this section, all things considered.

Nevada, Newlands projects.—There seems to be a general awakening among the dairymen of western Nevada on the importance of securing good sires for their dairy herds, and thus increase the production in future years—and the years pass very quickly.

J. R. Maben, located on the Shober J. Rogers farm southeast of Fallon, has a long banner covered with premium ribbons he has won with his herd in Oregon, and his opinion is therefore worth considering. He cites a case in Oregon where a bull was purchased for \$100. At nine years of age he was sold for \$200. Then it became known that the daughters of this sire increased 100 pounds of butter fat per year over their dams. This brought fame to this \$200 sire, and an offer of \$10,000 was refused.

It was no doubt an accident in getting this fine-blooded animal at \$100, but if the dairyman had secured a scrub instead, the 15 daughters probably would have depreciated 100 pounds of butter fat in comparison with their dams instead of increasing that amount, so that the difference in production at the prevailing prices at that time would mean an increase of \$1,500 a year for this man's herd.

In the latest "Reported Tests of Holstein-Friesian Cows," published biweekly at Delavan, Wis., H. U. Long, of Fallon, Nev., has one of his pure-bred Holstein-Friesian cows listed.

This cow, Flossie Butter Boy Walker, is reported as having made, at the age of 3 years and 10 months, a record of 438 pounds of milk and 20 pounds of butter fat in seven days, equivalent to 25 pounds of butter.

Tests of this kind are supervised by one or more representatives from the dairy division of the college of agriculture, present at each feeding and milking, to weigh the milk and test it for butter-fat content. A duplicate sample of this milk is forwarded to the State college, where careful check is made before the record is reported.

New Mexico-Texas, Rio Grande project.—The Fifth Annual Farm Bureau Day of Dona Ana County is now recorded in history as the bright particular star among the quintet of successful days of the bureau. Although a proper amount of attention was given to the social features of such occasions, the session was remarkable chiefly for the importance of the business transacted. Advantage of the meeting was taken by the farmers present to go on record in many matters of local and national importance. Plans were formulated and indorsed by the members which are calculated to enlarge the scope of the bureau and augment

its service to the farmers. Several important resolutions were adopted, including the following:

Raising the dues to \$10 per annum;

Favoring amendments to State constitution prohibiting ownership in lands by aliens;

Proposing legislation to legalize organizations for cooperative marketing;

To establish farm-loan associations in Dona Ana County.

One resolution passed is of special interest to the department and the service, and it is given in full elsewhere in this issue.

Mention has been made frequently in these columns of the growth of cooperative and marketing associations in the Mesilla Valley, but a complete list of these organizations has not yet been published. The following list includes all associations to date at this writing:

Dona Ana County Farm Bureau Marketing Association; Mesilla Valley Fruit Marketing Association; Mesilla Valley Sweet Potato Growers' Association; Mesilla Valley Poultry Association; Mesilla Valley Cabbage Sales Association; Mesilla Valley Beekeepers' Association. Then there is the Rio Grande Valley Dairy Association, which takes in dairymen in both upper and lower valleys.

A movement is now on foot to unify the upper and lower valleys in these associations, or to promote similar organizations in the lower valley. The alfalfa growers have signed up 15,000 acres and will market the entire crop through the Elephant Butte Alfalfa Association. The estimated production is 60,000 tons, valued at \$1,000,000.

From a personal letter recently received from friend Brook, president of the Elephant Butte irrigation district, we learn that August Wolf, of Spokane, has been selected to take charge of the publicity work for the valley. Our acquaintance with Mr. Wolf dates back many years. In fact it antedates the beginning of national reclamation. He wields a vigorous and facile pen and is well grounded in the work of publicity. With years of ripe experience in irrigation development and with a reputation for conservative statement and ability to present in graphic and interesting terms the chronicles of a valley, Mr. Wolf is certain to spread widely the advantages of the beautiful valley of the Rio Grande. The district is to be congratulated on its good judgment in selecting Mr. Wolf for this important position, and Mr. Wolf has our best wishes for success in his new location.

Oregon, Umatilla project.—The big gathering at the Bungalow Auditorium May 20, when the Commercial Club and the Community Club were hosts to the country folks, proved that there exists a friendly spirit of cooperation between the town and surrounding country. The committee in charge of the arrangements are to be congratulated on pulling off what is

considered one of the finest get-together meetings ever held on this project. The 500 or more people were a happy, jolly, good-natured bunch, and the committees had not omitted a detail in the entertainment of the visitors.

Hermiston is to have a new neighboring town. Cold Springs Landing will be the place, on a part of the Shaw homestead. E. P. Dodd, who now owns the land at the old Cold Springs station, will start the town, and E. I. Davis is now busy preparing the plat. The Newport Construction Co. and the Shotwell Contracting Co. will soon make camp on and near the new town, and begin the construction of the new highway leading from the new town to Holdman, thence to Pendleton.

This new road will tap the Cold Springs-Holdman wheat country and it is estimated from one-fourth to one-half million bushels of wheat will be stored in warehouses at the new town, when it will be necessary for the present siding to extend and other facilities to be provided. The contract for 13 miles of the new road has been let for the price of \$133,000, which will be spent largely at the new town and in Hermiston.

The Hermiston alfalfa mill operated by the C. S. McNaught Co. has practically completed its season's run. The first hay of the 1920 crop was brought to the mill on June 3 by W. G. Gordon, and since that time there were 3,060.6 tons brought in loose at the market price, which ranged from \$21 to \$9 per ton. The market price on hay has been decidedly downward. The \$21 price held only a short time, and before July 1 the mill price was \$16. The average price for loose hay for the season was \$14.06 per ton. The mill makes no attempt to buy large amounts of hay to hold for speculation, believing that its mission in the community is to afford a ready cash market for alfalfa when the grower is ready to sell. Apparently among the many growers there is a sufficiently great difference of opinion as to when the right time to sell has arrived to keep deliveries fairly well strung out, which, of course, is essential for the successful operation of the mill.

The company, besides handling loose hay at the mill, operates a field baler, and during the season 1,463.8 tons were disposed of in this manner. During the period there was purchased 915.5 tons baled by custom balers. The average price paid for baled hay was \$16 per ton f. o. b. the cars. For the purpose of comparing prices, a charge of \$3.50 per ton can be added to the loose hay brought to the mill, which would mean a price of \$17.56 per ton for baled hay.

Washington, Yakima project.—Fruit estimates for 1921 top any previous production for Yakima, Benton, and Kittitas Counties. H. A. Glen, Northern Pacific district agent, predicts Yakima and Benton Coun-

ties will send out 12,500 cars of apples, 1,200 peaches, 2,500 pears, 140 plums and prunes, 250 cherries, and 400 melons, a total of 16,990. W. L. Close, district horticultural inspector, reports for Yakima and Kittitas Counties as follows: Apples, 10,000 cars; pears, 1,200 cars; peaches, 600; plums and prunes, 130; and cherries, 150; total, 12,080. Some variance is apparent in the pear predictions, and the peach tonnage is cut by Close, who thinks the frost and aphids have played considerable damage. The June drop will decide whether the tonnage will be a record breaker or not.

The spinach pack at the big cannery of Libby, McNeill & Libby has been cleaned up and preparations are being made to handle the 1921 cherry crop next.

The spinach pack of this year amounted to about 700 tons, and was about three times the size of last year's pack. Many of the farmers who contracted with the cannery cleared as much as \$100 an acre from 5 acres of spinach, which is only a 60-day crop. Potatoes and other vegetables can be grown at the same time as spinach on the same ground. Most of the ranchers who brought in spinach have potatoes up 15 inches already. A yield of 5 tons per acre is a good yield for spinach. The cannery paid 1 cent a pound this year.

"The new freight rate schedule of the western railroads looks good to the canners. While it will not affect the local plant immediately, it means a 15 per cent reduction on canned goods," Manager George B. Kile, of the cannery, considers.

Growing asparagus has developed into one of the most profitable spring and early summer crops in this part of the Yakima Valley. Growers received a better price for their product than they have ever received before at this time of the year. This was due to the shortage in supply, which in turn was largely due to the cool weather. A. J. Sprong shipped on an average of 10 boxes daily from his 2½-acre field. F. G. Kassebaum averaged about 5 boxes daily from his field, while H. E. Nicolai shipped every day from a 2-acre tract. Ben Parker has 2 acres from which he is reported to have cleared \$400 during April. J. W. McKibben cut 5 or 6 boxes a day from three-quarters of an acre, while John Schlosser and Knight averaged 5 or 6 boxes every other day from one-half acre patches.

The first box was shipped from Sunnyside by Frank Crawford on April 8. Other growers followed in a day or so, and for these first shipments they received \$6 per box. Mr. Crawford has the largest field in the community, about 6½ acres, and he cut from 50 to 100 boxes a day. L. C. McDonald has a patch of 3½ acres from which he cut on an average of 25 boxes per day.

The asparagus sold for \$6 to \$2.75 per box.—C. J. B.



JULY SUGGESTIONS FOR POULTRY FARMERS.

By H. O. Numbers, Poultry Expert, Loretto, Pa.

WITH July we have the approach of the hot-weather season, and it is well for us to take precautions against lice and mites. If your chickens look pale around the head and appear drowsy, they invariably are infested with body lice. If you have only a small flock give them individual attention; that is, use a good louse killer and dust each one well. In larger flocks we suggest the system in use on our establishment. For every pen of 50 hens we have a dust bath, constructed in the following manner: A frame 4 feet square and 8 inches wide is placed on the floor under a window where the sun shines all day. We place about 4 inches of clean sand or road dust in the frame. In the sand we mix about 2 quarts of louse killer. The hens do the rest. We find a dust bath an indispensable adjunct to any successful poultry farm. The following is a good formula for killing lice: Take 3 parts of gasoline and 1 part crude carbolic acid; mix these together, and stir in enough plaster of Paris to absorb all the moisture. Mix thoroughly.

You will, however, use your own judgment as to renewing the sand. We change whenever soiled, and our birds are free from lice and in the "pink of condition."

The perch louse is a deadly foe to the hen. It does its work at night, while the hen is on the roost, sucking the vitality from the bird while it is asleep. Perch lice will soon deplete a flock. You will find them in clusters in cracks, crevices, or under dirt or dried droppings. They are a very small red mite. We can not emphasize too strongly the absolute necessity of thoroughly cleaning your droppings board. Filth simply breeds them. Keep your perch poles well painted with kerosene. We find this to be the best preventive. We use an ordinary whitewash brush and paint at least once every two weeks during hot weather. We also sprinkle kerosene over the droppings board. This is the most effective method we have discovered to get rid of perch lice. We avoid the use of lime. There is an old-fashioned idea that lime is essential around a poultry house. It is not. Lime dusted on perch poles results in sore feet and scaly legs. Lime dusted on the droppings board will

deteriorate the value of the manure for fertilizer purposes, as it liberates the ammonia which contains nitrogen. Furthermore, if you enter a poultry house that has been dusted with lime, you encounter a very offensive odor, which is not only repulsive to man, but is not conducive to good health in the flock. We dust our droppings board with nothing but clean sand and this conserves the fertilizer properties of the manure as well as provides an odorless poultry house. Our buildings are all painted inside; hence there is no harboring place for mites.

A word about the care of your nest boxes is in order. Clean nests mean salable eggs; on our establishment we exact the strictest care as to our nest boxes. Cleanliness almost to a fault is our system. Do you know that an egg shell is porous and absorbs either filth or cleanliness, as the contact may be? A dirty, dusty nest, polluted with manure, feathers, lice, and dirty straw is positively no fit receptacle for so dainty an article of food as the egg. Yet the average farm flock is not provided with sanitation in regard to nest boxes. Have you ever noted the egg quotations on the markets? An item of "washed eggs" is generally quoted from 4 to 5 cents per dozen less than first-grade eggs. Why are there "washed eggs"? Dirty nests are largely responsible. The writer refuses to eat eggs away from home, as he knows too well under what insanitary conditions the ordinary egg is produced. We appeal to you, therefore, to think of your customer when you sell eggs. Think also of the raw eggs, consumed by people in ill health, of the thousands of children who depend upon the egg for their major article of diet. So why not produce a product that you can honestly advertise as "strictly fresh, laid under sanitary conditions"?

For the benefit of the RECORD readers we will cheerfully answer any questions, or assist you in your poultry problems, through the RECLAMATION RECORD. We believe that we can be of mutual assistance. The only requirement is that your questions be in our hands before the 10th of the month, so as to insure publication in the current issue. Address communications to H. O. Numbers, Loretto, Pa.

Sugar-Beet Production and Live-Stock Raising.

There is a close and important relation between the production of sugar beets and the raising of live stock, especially cattle and sheep. Not only will the live stock, if properly handled, produce an important part of the farm income, but they are very essential to soil improvement.

The keeping of live stock enables the beet grower to make the best possible use of the beet tops, which, in connection with roughage, easily produced, keeps the live stock in good condition and enables the farmer to return the mineral element in the tops to the soil and increase the supply of humus, which is of essential importance in irrigated sections. Sheep as well as cattle thrive on beet tops, but it is wise to feed them sparingly at first.

In some localities stock is pastured on the tops after the beet roots have been removed. This saves time and labor, but it is rather wasteful of the tops and frequently injures the ground. It is usually more satisfactory to gather and haul the tops to the feed yard and feed them from a rack, or they may be used as silage either in a silo or in a trench 4 or 5 feet deep and long and wide enough to hold the tops and the roughage necessary to make the silage. A layer of straw about 6 inches deep should be put in the bottom of the silo. The beet tops and straw or other roughage should then be added in alternate layers and firmly packed to prevent spoiling.

The by-products of the beet field and sugar mill that are of especial importance to the farmer are the beet tops, pulp, molasses, and the waste lime. Many farmers sell the tops for cash, prices ranging from \$2.50 to \$5 per acre. This is usually not the best practice. The tops are of greater value as a stock feed and contain elements which should be kept on the farm. Beet pulp is likewise an excellent stock feed and may be used either fresh as it comes from the mill or dried. Beet molasses is the residue after the crystallizable sugar has been removed from the concentrated beet juice. It may be fed by itself or mixed with chopped roughage by spreading it over beet pulp, alfalfa, etc., or drying it with beet pulp. Waste lime is a by-product of the sugar mill which, under certain conditions, is of considerable value to the farmer in correcting the acid condition of the soil and in making the heavy soils more friable.

Sugar beets are grown in 17 States, in 10 of which the growers depend, in whole or in part, upon irrigation. The successful production of sugar beets under irrigation depends not only upon an adequate supply of irrigating water, but upon a suitable system of crop rotation, a thorough preparation of the seed bed, careful planting and thinning, timely and thorough cultivation, in addition to a supply of live stock which will balance with crop production. In addition to a suitable irrigating system the land should be provided

with a satisfactory system of drainage; furthermore, the soil should be well supplied with humus.

Feeding Young Turkeys.

R. T. Parkhurst, associate professor of poultry husbandry in the University of Idaho, calls attention to the fact that young turkeys are very particular about their food and will not usually touch any food that is not already familiar to them. For this reason the articles of food that they will need as they grow older are supplied from the first. Do not feed until the poults are at least 24 hours old, and then be careful not to overfeed.

A satisfactory first feed is a small amount of finely crumbled boiled egg, shell included. This is given three to six times a day for a week. After the second day a supply of clean water and fine grit should always be available. A sprinkle of fine chick feed is given along with the crumbled egg, since grain forms a large part of the ration, being fed three times daily from the second to the sixth week. This grain may be a good, clean commercial chick feed or a mixture of fine cracked corn, cracked wheat, and oatmeal. In addition, allow the poults to range where they can get plenty of green feed and insects. Their feeding place and quarters should be as far from the hen yard as possible as a precaution against disease. After the turkeys are a month or six weeks old, mixed whole grains should be added to the chick feed and may replace it as soon as the turkeys are found to take the larger grain. The mixture may consist of wheat, corn, or oats. Feeding twice or even once a day is usually sufficient from this time on.

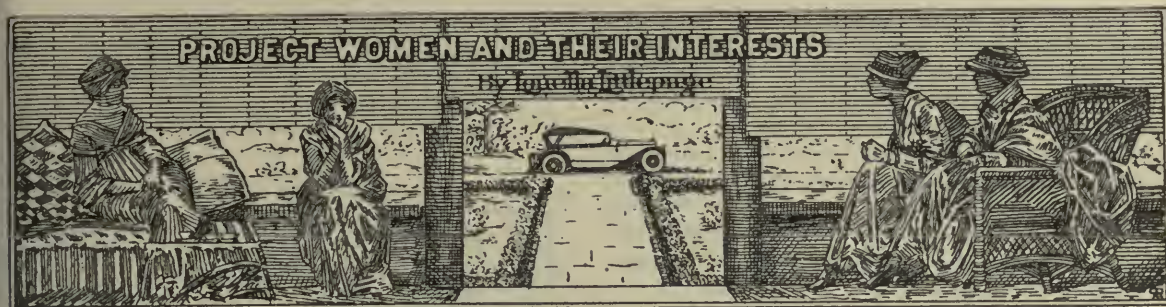
RECLAMATION ABROAD.

Sonora Irrigation Project, Mexico.

The press of Mexico City reports that the Mexican Federal Government has appropriated \$20,000 to be used in the continuation and improvement of irrigation in the Yaqui River Valley, Sonora. This probably refers to the Marcus Aurelius irrigation canal in the Yaqui Valley, 30 miles southeast of Guaymas, where a little work has been done from time to time for the past two years. The only irrigation plant of any importance in that section is that of the Richardson Construction Co., Esperanza.—*Commerce Reports.*

Shrubs should, for the most part, be massed about the borders of the home grounds or in the rear. Occasionally low masses of them may be placed at the angles of drives or walks.

The underlying idea in all testing should be to obtain an honest record of a cow's ability in order to know her value as a producer and as an animal for breeding purposes.



WHY SHOULDN'T YOU HAVE ONE?

TONS of literature have been published about the social needs of the farm, about the necessity for good roads, and better schools, and women's clubs, and all that; but to the farm woman it's rather putting the cart before the horse, because these things are really the frills, the afterthoughts, and not the foundation of rural happiness at all.

The first thing to do is to give the farm woman a chance to get her work done within 16 hours a day so that she may have a bit of time to think about other matters. Good roads don't interest a woman who never has time to go out on them. Women's clubs will not elevate the woman who can't attend the meetings on account of the churning or the washing. Poems on the "Scent of New Mown Hay" haven't the slightest interest for the woman whose back is aching from lugging water from a spring or pumping and carrying it from the well. A community discussion on Hamlet's sanity will not furnish her much amusement when she is too busy saving herself from going crazy to take part in it.

The fact is that the average country house which is equipped with water works doesn't need any "uplift" work. The good old summer time is here in earnest, but with all the wearisome routine of seedtime and harvest no sane country woman will envy her city sister if she can step over to the sink, turn a spigot, and draw water, hot or cold, without effort, delay, or even thought. Such a home is sure soon to have a spigot in the garden and another on the lawn for the truck and grass. It will soon be heated with hot water or steam furnace. It will have some kind of a lighting system instead of the old kerosene lamp. All the modern conveniences will follow as the night the day because the man who starts out to make his home a livable place instead of a treadmill will soon discover that it not only pays in increased comfort and happiness but that it increases the value of his acres more than any other improvement which he can make. It is safe to say that a water-works system which costs, say, \$2 per acre for a 160-acre farm will increase the selling value of his property at least \$5 per acre.

Ever think of why the well on the average farm was dug where it is? Nine cases out of ten it was dug

where it would be most convenient to the barnyard. The cattle were thought of first, leaving the inhabitants to adjust themselves to the conditions imposed by the necessities of the barnyard.

There is no good reason why any self-respecting farm should be without an elemental device for pumping water to both house and barn to make life easier and its burdens lighter. The lowest-paid laborer in the city insists on more conveniences than many prosperous farms enjoy.

A harvesting machine before the war cost about \$120. For that amount at that time a water system could be put in that would pump water from the well to a tank and thence pipe it to the kitchen and also to the barnyard. While prices are higher now, the relative cost of both items is about the same. A harvester works only a few days in the year; the water plant works 365 days.

They Can Can.

Offering information about canning and preserving to project women is like carrying coals to Newcastle, for if there is a place on the map where women can can it is on the Government irrigation projects. At the same time a condensed chart for reference will be found convenient even for the experienced, and there may still be a few unconverted ones who may be tempted to try the method out.

It seems almost incredible that there are women with gardens who do not can either fruits or vegetables for winter consumption. Said one such recently: "Magazines nowadays are devoting entirely too much space to canning and drying propaganda to suit me. We have fresh fruits and vegetables through a long growing season, and when winter comes I am glad to have a change and buy canned goods when I want them. Besides, I have enough to do without putting up food."

Disinclination to perform the work of conserving food is much more than offset by various good reasons why it should be done. Doctors tell us that both fruits and green vegetables are absolutely essential in the diet, for from these sources we get the vitamins, the mineral matter, and the bulk, all so vital in keeping our human mechanism in good functioning order.

It saves time to can. A few hours now and then during the summer will make the preparation of meals during the remainder of the year a simple matter and give the busy housewife many hours for sewing, reading, or recreation.

It saves money to can. Even in the tiniest of gardens there is always an excess of fruit or vegetables which otherwise would be wasted. The cold-pack method, preserving every nourishing content as well as the delicate flavor, takes the place of expensive substitutes from the store.

It offers a variation in the diet which can not otherwise be had on farms where the growing season does not continue throughout the year. It offers a solution to the fresh-meat problem. Poultry, rabbits, game, lamb, beef, pork, etc., are easily preserved by canning, and no one who has not had the experience can ever understand the sense of peace which comes from well-stocked shelves where an entire meal may be selected upon short notice and in emergencies.

Chart for canning vegetables.

Vegetables.	Blanching.	Sterilizing.			
		Hot water.	Water seal.	Steam pressure.	
	<i>Minutes.</i>	<i>Minutes.</i>	<i>Minutes.</i>	<i>Minutes.</i>	<i>Pounds steam.</i>
Greens.....	15 to 20	120	90	60	5
Cabbage.....	15 to 20	120	90	60	5
Cauliflower.....	15 to 20	120	90	60	5
Carrots.....	5 to 8	90	75	60	5
Parsnips.....	5 to 8	90	75	60	5
Beets.....	3 to 8	90	75	60	5
Turnips.....	5 to 8	90	75	60	5
Tomatoes.....	(1)	22	18	15	5
Corn.....	5 to 15	180	90	60	5
Lima beans.....	2 to 5	120	90	60	5
String beans.....	2 to 5	120	90	60	5
Peas.....	2 to 5	120	90	60	5
Pumpkin or squash.....	(2)	90	90	60	5
Pumpkin or squash cubes.....	10	90	90	60	5

¹ To loosen skin.

² Cook 30 minutes.

PRECAUTIONS.

Follow directions. Do not use your own judgment. Mold will develop if sealing is defective or if the tops are removed after sterilizing. Do not keep in a damp place where rubbers may decompose.

Careless packing must be avoided. Vegetables and fruits should be packed closely in containers and after this has been done the containers should be filled with hot salted water in the case of vegetables and sirup in the case of fruits. If the packing is not properly done shrinkage may take place during sterilization.

Guard against improper or inadequate blanching and cold dipping. Follow instructions carefully.

In canning vegetable greens, including spinach, dandelions, and kindred vegetables, cabbage, brussels sprouts, and cauliflower, it is important that the mineral salts and volatile oils should not be lost. The retention of these is required for good results. For this reason the greens must never be blanched in hot

Chart for canning fruits.

Preparation.	Hot-water bath.	Water seal.		Pressure cooker.	
		214°.			
	<i>Min.</i>	<i>Min.</i>	<i>Min.</i>	<i>Lbs</i>	
<i>Apples.</i> —Pare, cut up and core, or leave whole as desired. Put in slightly salted water to prevent discoloration. Blanch $\frac{1}{2}$ minutes. Pack in hot jars. Fill jars with thin or medium sirup. Screw covers loosely in place.	20	12	{ 8 6	{ 5 10	
<i>Apples for pies and salads.</i> —Pare, cut up and core, or leave whole and core. Put into slightly salted water. Pack in jars; add hot, thin sirup.	16	10	{ 8 6	{ 5 10	
<i>Apricots.</i> —Wash. Leave whole or cut in halves and remove pits. Pack in jars; fill with a thin or medium sirup.	16	12	{ 10 5	{ 5 10	
<i>Blackberries.</i> —Pick over. Put in sieve and run cold water over them. Pack in jars as closely as possible without crushing. Fill jars with thin sirup.	16	12	{ 10 5	{ 5 10	
<i>Blueberries.</i> —Pick over. Put in sieve and run water over them. Blanch one-half minute. Pack closely in hot jars.	25	18	{ 15 10	{ 5 10	
<i>Cherries.</i> —Wash. Remove stem and pits. Pack in jars. Fill with thin sirup if cherries are sweet and medium if sour.	16	12	{ 10 5	{ 5 10	
<i>Currents.</i> —Wash and stem. Pack in jars same as blueberries.	25	18	{ 15 10 10	{ 5 10 10	
Or fill jars with medium sirup.	16	12	{ 10 5	{ 5 10	
<i>Deubarries.</i> —Wash and stem. Pack in jars; fill with thin sirup.	16	12	{ 10 5	{ 5 10	
<i>Figs.</i> —Wash. Blanch 6 minutes. Pack in jars; add thin sirup.	40	30	{ 25 20	{ 5 10	
<i>Gooseberries.</i> —Wash. Stem and pick off blossom end. Pack in jars; fill with medium sirup.	16	12	{ 10 5	{ 5 10	
<i>Grapes.</i> —Wash and remove from stem. Pack in jars; fill with thin sirup.	16	12	{ 10 5	{ 5 10	
<i>Peaches.</i> —Blanch 2 minutes. Remove skins. Cut in halves; pack in jars fitting halves into one another to save room. Fill jars with thin sirup.	16	12	{ 10 5	{ 5 10	
<i>Pears.</i> —Wash. Pare and cut in halves. Remove core. Blanch $\frac{1}{2}$ minutes. Pack in jars; fill jars with thin sirup.	20	15	{ 8 6	{ 5 10	
<i>Plums.</i> —Wash. Pare if you wish a delicate flavor. Remove pit or not. Pack in jars; fill with medium sirup.	16	12	{ 10 5	{ 5 10	
<i>Pineapples.</i> —Cut off skin and remove eyes. Slice or cut into cubes. Blanch 5 minutes. Pack in jars; fill with medium sirup.	30	25	{ 25 18	{ 5 10	
<i>Quinces.</i> —Pare, core and cut into pieces. Put in slightly salted water. Blanch 6 minutes. Pack in jars; fill with thin sirup.	40	30	{ 25 20	{ 5 10	
<i>Raspberries.</i> —Pick over; rinse in sieve. Pack in jars; fill with thin or medium sirup.	16	12	{ 10 5	{ 5 10	
<i>Rhubarb.</i> —Wash and cut into cubes. Do not remove skin if you wish red color. Blanch 2 minutes. Pack in jars; fill with medium sirup.	16	12	{ 10 5	{ 5 10	
<i>Strawberries.</i> —Rinse in sieve and hull. Pack tightly in jars; fill with thin or medium sirup.	16	12	{ 10 5	{ 5 10	

For preserves fill the jars with thick sirup rather than the thinner ones. When canning without sugar use hot water in place of sirup; add 10 minutes to the period of processing.

Have sirup boiling hot when filling the jars.

For pint jars process 3 minutes less than above time. For 2-quart jars add 3 minutes to time.

Wrap jars in paper to prevent discoloration.

water. The blanching must be in steam. This may be done by suspending them in a closed vessel partially filled with boiling water, taking care to see that they are above the water line.

It is important that vegetables and fruits should not be allowed to remain too long in the sterilizer. Watch the time and follow the schedule.

One of the things to be avoided with canned peas, corn, beans, and asparagus is the development of what

is known as "flat sour." This may be avoided by using vegetables which have not been gathered more than five or six hours. Blanch, cold dip, and pack one jar of these at a time, placing each jar in the canner as it is packed. This precaution should not be overlooked.

Anent Pieplant.

Mrs. Susa Young Gates, editor of the Relief Society Magazine, Salt Lake City, inclosed an article on pieplant in a delightful letter which contains some suggestions too good to be simply buried in the Government letter files. Says she:

"I always enjoy the Women's Department of the RECORD, and I am inclosing some items about pieplant, or rhubarb, which may prove helpful to the readers. Women should always insist on getting the best varieties of fruits and vegetables for home use anyway. No one can make poor varieties of fruit taste like good varieties, no matter how well they cook or how much sugar or spice may be added to the mixture. My husband has succumbed to the strawberry pieplant theory and has dug up all the poor old pieplant roots in our 6 by 9 city garden to make way for the strawberry variety.

"We have a Session plum out here which is really the best plum I ever cooked, both for jelly and preserves, as well as for use fresh. I understand it is a seedling here, but there is as much difference as you could possibly imagine in the flavor of this plum when compared with any other variety.

"Do you know anything about the snow apple? It comes in September here or early in October and lasts until Christmas. The flavor is richer than the Astrachan and it is a snowball when baked. Dig out the core, fill in with sugar and butter, and bake 20 minutes. You will have the most delicious of baked apples, not even excepting the Rhode Island Greening, and the apple is just as good to look at or eat raw as cooked. Good luck to the department."

Selecting and Cooking Pieplant.

By Mrs. Susa Young Gates.

Few housekeepers know the difference between good and bad pieplant; indeed few farmers know the difference between pieplant and pieplant. There is as much difference as there is between Snow apples and Winesaps, or between Crawford and Alberta peaches; or between Hood River strawberries and the most inferior kind.

I have been trying for years to convert my husband-gardener to the fact that there are two varieties of pieplant, one of which is worthless and the other delicious when properly cooked. I have succeeded at last by cooking the two kinds at the same time, exactly alike, and getting him to sample the result. The worthless pieplant cooks to pieces and has no

flavor at all, but is simply a sharp, acid, mushy stock which is valueless to the cook. This pieplant grows often very large and is like a bullrush in flavor.

"Strawberry pieplant" is of European origin and does not grow large but is long and of a bright red color from leaf to root. It cooks as quickly as the other and unless overcooked it retains shape and color. Don't let grocers deceive you—they sometimes tie up the two kinds together and call it strawberry pieplant.

COOK PIEPLANT AS FOLLOWS.

Cut it into inch pieces without stripping the silken coating off, and drop it into the kettle, keeping the delicate root end in a separate vessel as you cut it up, then put the pink ends on top. Add no water to the pieplant in cooking. Measure a heaping cup of sugar to a pound of pieplant and put the kettle onto a medium fire and keep it covered tight so that it will steam. As it begins to get hot draw it to a cooler part of the stove and finish cooking slowly. It needs to boil only for a few moments.

In making pieplant pies beat up one egg to three pies with a tablespoonful of cornstarch, and stir this carefully into the cooked fruit. It will prevent the juice from running.

CANNING RHUBARB.

Because of its extreme acidity, rhubarb, or pieplant, may be canned without the process required for other products, as the acid destroys germ life. Select rhubarb that is young and tender, cutting into 2-inch pieces or into lengths which fit the containers. Sterilize the jars or whatever containers you use in advance. Pack the prepared rhubarb in the containers in an upright position and then cover the contents with cold water. Allow to stand 10 minutes, drain off the water, fill again with cold water and seal, using sterilized rubber and cover.

Lye Bath for Fruit.

Paring peaches, pears, and plums with a knife cuts off and wastes a lot of fruit even with the most careful and skilled paring, and careful paring takes a good deal of time. Experts say the fruit next to the skin has the finest flavor and this part is cut off and thrown away with the skin when a paring knife, however sharp, is used. It is much more economical and saves a great deal of labor to peel fruits with lye.

The process of peeling peaches, pears, and plums by dipping in hot lye solution is, moreover, approved by the United States Government Board of Food and Drug Inspection, which reports that lye peeling has no bad effect on the quality or flavor of the fruit and is not contrary to the requirements of the pure

food law. Lye peeling saves time, fruit, and trouble, is wholesome, rapid, cleanly, and economical.

All you need is a good iron kettle big enough to hold plenty of water, a wire basket with side handle, preferably to hold the fruit, a 10-cent can of lye, and a little alum.

To 9 gallons of cold water add half a 10-cent can of lye and a half ounce of alum. Bring to a boil. The kettle should be not over two-thirds full of water—this for safety to prevent splashing of the hot solution when the fruit is plunged into the kettle. When the mixture is boiling, lower the fruit into the boiling solution in a wire basket or in a thin but firm cloth, such as cheesecloth. For smaller quantities of fruit use 4 tablespoons of lye to 1 gallon of water, with a pinch of alum added.

Let the fruit remain two minutes in the hot lye solution, then put it through two cold-water baths to thoroughly remove the lye, and in the second bath of cold water rub off with the hands the small pieces of fruit skins that sometimes persist in clinging to the fruit.

Keep the lye solution hot for use, but abandon it for fresh solution of lye as soon as it turns dark, for it has then lost strength.

El Paso's Bird Census.

Any section would do well to emulate the example of El Paso, where an attempt is being made to get a complete bird census. This lively border town has an unusually large and brilliant bird citizenship, one to be proud of, and bird lovers have been requested to send in lists of birds personally known to them as residents or transients, dividing it, if possible, into lists of those known to nest there, those that possibly do, and those known only to rest there on their long flights from Mexico or South America to the North or to Canada.

A long list was sent in from one of the ranch homes. Can any boy or girl name as many birds in their own section? Here it is:

Cowbirds or cuckoos.	Orioles, common tropical.
Orioles, Bullock's tropical.	Meadow larks.
Painted buntings.	Roadrunners, chaparral
Shrikes.	cocks.
Blackbirds, saffron headed.	Summer redbirds.
Blackbirds, red-shouldered	Cockatoos, gray with orange
marsh.	back, and rose-colored
Blackbirds, red-shouldered	breast.
starling.	Canaries.
Blackbirds, rusty grackles.	Curlews.
Ducks; several varieties.	Coots.
Flycatchers.	Hummingbirds, mango.
Goldfinches; several other	Killees.
varieties of finches.	Mountain jays, cloudcrofters.
Golden plovers.	Mocking birds.
Nuthatches.	Rails.
Snipes.	Swallows.
Sandpipers.	Thrushes, rallercrows.
Vireos; several varieties.	Warblers; several varieties.

These birds were all named from Audubon's descriptions and names. Florence Merriam Bailey's Handbook of the Birds of the Western United States is said to be about the handiest and easiest book for amateurs. It is especially likable because, besides the scientific descriptions, there is always a sentence or two or a paragraph of description as the ordinary and unscientific bird lover would see his friends. These descriptions are most alive and personal and catch the gleam of color, the odd tricks of wings, the awkwardness or swiftness, the little tricksey notes, and the tumultuous singing, so that one can recognize the friends of his garden or trail almost by the talk.

Why not encourage the boys and girls to interest themselves in birds, now that vacation days are here? Call attention to their skillful craftsmanship, to their happiness in just living, to the wonders of their mechanics of flight, to their dainty manners, and how exquisitely they are clothed. A child never will be cruel to any living thing who has become a real friend and champion of the birds.

"Coming of Water" Pageant.

The high-school pupils at Grandview, Yakima project, Wash., gave a beautiful pageant the latter part of May that was witnessed by more than 1,000 people. The spectacle was presented on the school lawn which was transformed into a veritable fairyland, where bouncing red apples came to life and romped with the flowers, and even the prosaic dust storm was beautiful.

From the moment when the cacti in the fluffy green costumes came hopping stiffly onto the lawn to dance a lively round with the gray sagebrush to the end of the final romp of all, the characters in the reign of Happiness and Prosperity, the pageant was a decided success.

The theme was cleverly worked out and the costumes and splendid training carried out the whole entertainment in a delightful manner. The surveyor's dance was very popular because of the skillful way in which the boys performed the difficult evolutions of the drill with their rods. Perhaps the most realistic dance was the sand storm. One could almost see the sudden fierce gusts of dust-laden winds, then the lull that followed and the continual swish and whirl. The most graceful dance was that of alfalfa. The vivid green costumes were very pretty, and the slow swaying motion of the dance called quite clearly to mind the swaying of a field of alfalfa in the wind. The solo dances, too, were charming, the Spirit of Water was a beautiful picture of unstudied grace, and Prosperity and Happiness were unaffected and graceful.

The community is justly proud of the performance.

Reclamation Record Cook Book.

ORANGE CHARLOTTE.

(By Miss R. C. Watkins, Stenographic Section, Washington Office.)

$\frac{1}{2}$ of a box of gelatin.	Juice one lemon.
$\frac{1}{2}$ cupful cold water.	1 cupful orange juice and pulp.
$\frac{1}{2}$ cupful boiling water.	A little grated orange peel.
1 cup sugar.	Whites 4 eggs.

Soak gelatin in cold water one hour. Pour boiling water over the lemon and orange juice, cover and let it stand half an hour; then add the sugar, let it come to a boil, stir in the gelatin, and when it is thoroughly dissolved take from fire. When cool enough, beat into it the 4 beaten whites of eggs, turn into a mold and set in a cold place to stiffen, first placing pieces of sponge cake all around the mold.

ESCALOPED HAM.

(By Ray B. Dame, Photographer, Washington Office.)

Slice potatoes in thin round slices and place a layer in a buttered baking dish. Don't salt, but sprinkle with pepper and with flour. Place another layer on top of this and treat as the first one. Then fill the dish even with the top layer with milk and bake about 20 minutes in moderate oven. Then lay slices of ham on top and bake until the ham is well done. Serve at once.

HOW TO COOK AN OLD HAM.

(By Mrs. L. P. Littlepage, Settlement Section, Washington Office.)

Soak in cold water over night. Drain, remove all mold and loose pieces, and rinse well.

Cover with cold water, add 2 tablespoonfuls of vinegar for medium-sized ham, add one-half cup brown sugar, 4 cloves, and 1 bay leaf, and heat to boiling. Reduce heat to constant simmer and cook at this temperature at the rate of 20 minutes for each pound of ham.

Remove from fire, but keep ham in the liquor in which it was cooked until cold; then remove from container and allow to drain.

Take off the skin, score the fat in inch blocks and cover with a coating of brown sugar and crumbs. Stick with cloves 1 inch apart.

Bake in slow oven until nicely browned, basting at intervals with half cup of water and tablespoonful of vinegar.

BEST MARSHMALLOW CAKE.

(By Mrs. L. B. Kilbourn, Olathe, Uncompahgre project, Colo.)

1 cup sugar.	1 teaspoonful cloves.
1 cup molasses.	2 teaspoonfuls soda in 1 cup
$\frac{1}{2}$ cup butter.	boiling water.
1 teaspoonful cinnamon.	2 $\frac{1}{2}$ cups flour.
1 teaspoonful ginger.	2 eggs.

Add spices to sugar and mix thoroughly, then add butter and beat to a cream. Add molasses, then boiling water with soda dissolved in it; after which stir in the flour, and lastly the well-beaten eggs. Bake either in gem tins or in a loaf. Eggs may be omitted.

STRAWBERRY ICE CREAM.

(By Mrs. James L. Marr, Rio Grande project, Texas.)

Mash 2 quarts of ripe strawberries and add 2 pounds of sugar. Wait until sugar dissolves and then add 1 $\frac{1}{2}$ pints of water, 1 teaspoonful lemon juice. Freeze until hard. Remove dasher from freezer and pack mixture solidly. Whip 1 quart of whipping cream, add 1 cup powdered sugar, 1 teaspoonful vanilla, 1 cup chopped pecans. Open the freezer and with butcher knife cut circle clear through to bottom and scoop out. Fill this cavity with the cream mixture and then pack the freezer in ice and salt and leave until very hard. When ready to serve cut in slices.

TONGUE WITH MUSHROOMS.

(By Irma Brown, Salt River project, Arizona.)

Boil one beef tongue two hours. Remove from boiler and trim and skin. Make gravy in large saucepan by frying brown in a little butter 2 tablespoonfuls sliced salt pork, 1 large onion, and 1 clove garlic chopped fine. To this add 2 cups of the tongue stock, 1 can mushrooms, 1 tablespoonful Worcestershire sauce, a good pinch of powdered bay leaf, thyme, salt, and paprika, 1 clove, and 3 chopped green olives. Thicken with 2 tablespoonfuls browned flour. Place tongue in this gravy and let cook slowly 30 minutes. Serve on large platter garnished with parsley.

Notes from Other Projects.

The live town of Chandler, on the Salt River project, has a live town marshal, and he has been encouraging the boys and girls in different parts of town to keep the places of their parents in apple-pie order. Not only that, but a series of cash prizes has been arranged for to be bestowed for the best-kept yards and the alley and street adjacent.

Not all the details have been worked out, but the contest will run until the 1st of January. A weekly inspection will be made. It isn't necessary to have a mansion for a home in order to enter the race; any house and yard can be made attractive by keeping it clean, and it is on this basis of neatness that the judging will be done.

A prize is also offered for the best lawn put in and the care it receives and how it compares with others on January 1.

The Chandler Woman's Club has opened free reading rooms and library, and everybody who cares to spend a little time reading is invited to drop in. Magazines of all kinds are provided and the place is open afternoon and evening. The rest room will prove an attraction especially to country women, who may desire to brush up after the drive to town or to leave packages or rest a bit before starting home.

BERRIES OF ALL KINDS GIVE QUICK RETURNS.

By the United States Department of Agriculture.

A CITY woman who moved to a remote eastern district summarized the disadvantages of her location by saying that she was 40 miles from a lemon. Fruit of some kind is almost essential to the health and happiness of any family, and in developing reclamation projects, which in some cases are far from market, provision for a home supply of fruit should never be neglected. Tinned products will never take the place of home-canned, and in the season when fresh fruits are available there is no comparison whatever.

Apple, pear, peach, plum, and cherry orchards require several years before they give any return. Although these are highly desirable, the farmer in almost any of the reclamation regions can furnish an acceptable substitute by cultivating small fruits, such as strawberries, raspberries, blackberries, dewberries, currants, and gooseberries. Strawberries planted in the spring, or early enough in the autumn to make a good growth before the advent of cold weather, should produce a good crop the next season. Raspberries, blackberries, and dewberries, if planted in the spring, should bear a light crop the next year. Currants, gooseberries, and grapes commonly bear the third season after planting.

SAVE MONEY BY GROWING HOME FRUIT SUPPLY.

The present almost prohibitive freight rates, which will cut down the amount of farmers' cash profits in most parts of the country this year, and which will also make the cost of shipping fruits extremely high, should induce farmers to grow their own supply. Beginning with the fruit which will bear in one season, and building up a second line with the slower maturing species, a sufficient range in varieties can be produced throughout a large portion of the reclamation regions to provide a supply in the fresh state for the table during a large part of the year. The

remaining months can be bridged by canning or otherwise conserving for use when desired.

The location of the land on which the fruits are planted, other things being equal, should be convenient to the house. It should be well drained and the air drainage must also be good. Cold air settles to the lowest levels, and if a site is so located that cold air settles over it from some surrounding higher elevation the fruit blossoms are likely to be killed by untimely spring frosts or the fruit may be injured by freezes in the autumn, when sites located on the sides of slopes or at points which are higher than the surrounding area escape such injury. Most fruit can be grown on a great variety of soils, but where possible it is better to avoid light sandy soils and heavy clays.

Good nursery stock adapted to the particular locality is an essential. The average small planter is not often in direct touch with nurserymen. He is, however, often visited by a traveling fruit-tree agent, who may or may not represent a reliable nursery and who may or may not know the merits of different varieties and their adaptability to different conditions and regions. The planter should know what he wants and should place his order accordingly. He should avoid high-priced novelties. Let somebody else do the experimenting. It is better for a grower to deal directly with nurserymen rather than through an agent, although some of the best nurserymen do an agency business. In selecting varieties a prospective planter should avail himself of the suggestions of experienced fruit growers in his community, the experiment station or the extension division of his State college of agriculture, or the United States Department of Agriculture.

Here is a list of varieties of the principal small fruits recommended by the United States Department of Agriculture for eastern Washington, Oregon, Idaho, Nevada, Utah, western Colorado, and northern Arizona and New Mexico:



Left: Strawberries planted in raised wide rows. Right: A field of raspberries.

Raspberries.—Marlboro, Cuthbert.

Blackberries.—Eldorado, Lawton, Snyder, Logan (in the milder valleys of Idaho, Oregon, and Washington).

Dewberry.—Lucretia.

Currants.—Perfection (red), White Imperial.

Gooseberries.—Oregon, Poorman.

Strawberries.—Dunlap, Jucunda (in Colorado and Utah), Clark, Superb.

Some additions may be made on the advice of a responsible nurseryman. It is well to get as many catalogues as you think you can look through, and study them early enough to permit time for some correspondence with the dealer.

STRAWBERRIES ARE A GREAT FAVORITE.

Because of their lusciousness, quick bearing, and comparative ease of cultivation, strawberries are a great favorite among fruits. They must be grown largely under irrigation to make crop production reasonably sure in most reclamation territory. Several factors limit strawberry production in the reclamation States. These are moisture, alkali, nematodes, accessibility to markets, transportation facilities, and the labor supply. For a small patch to furnish fruit for home consumption, some of these considerations may be disregarded. Alkaline soil is an enemy of strawberries and should be avoided. Nematode parasites, also known as eelworms and gall worms, can be combated generally by growing crops for a year or two which are not food for the parasites.

The preparation of the land for the planting of strawberries should be complete and thorough. Any neglect or failure in this respect before setting the plants is likely to prove costly later. If the soil is not abundantly supplied with humus it should be supplied before planting, either by making heavy application of one or more green-manure crops, preferably a cations of manure or by the growing and turning legume such as clover or alfalfa.

Where the land is to be irrigated it must be leveled or contoured, and furrows must be provided to convey the water through the fields. Unless the field is level or the slope even, water will collect in depressions so that some plants will be flooded, while others will receive too little water. In most sections the plants are set on raised beds, which vary in width from slightly more than a foot to several feet. If the water percolates through the soil rapidly so that the entire bed is moistened readily, wide beds may be used, while if the soil is of such a type that water percolates through it with difficulty, the beds must be made much narrower. They should be raised above the furrows from 2 to 12 inches. In most localities the season of planting will depend upon the period of greatest rainfall, although it is not necessary to rely so largely on rainfall where irrigation is used.

TWO SYSTEMS OF PLANTING.

Two general systems of planting and training strawberries are used—the hill system and the matted-row system. When they are to be grown under the hill system, strawberry plants are commonly set 12 inches apart in the row and all runners removed as they appear. Under the matted-row system, plants are set from 18 inches to 4 feet apart in rows, and part or all of the runners are allowed to root. Perhaps the most common practice in irrigated regions is to allow each plant to make a definite number of new runner plants. These are spaced from 6 to 8 inches apart and all others removed as fast as they develop. Spacing is done by covering the tips of the runners with earth as soon as they begin to enlarge. Farmers' Bulletin 1027, sent free by the United States Department of Agriculture, will give more detailed information on the growing, care, and preserving of strawberries.

Three types of raspberries, red, black, and purple, are grown extensively in the United States. Red raspberries are generally the hardiest of the three, and can be grown in localities which will not produce the others. They have erect canes and usually are propagated by the suckers which come from the root of the parent plant. Among the leading red varieties are the Cuthbert, Ramere, and King.

Black raspberries have arched canes which root at the tips in the autumn and are propagated by the plants formed at the tips. The Gregg, Ohio, and Cumberland are important commercial sorts of the black type. Purple raspberries are hybrids between the red and black and have canes that arch and root at the tips like black raspberries.

Before setting out a raspberry patch it is advisable to study the locality and confer with the nurserymen. Raspberries do not thrive when exposed either to intense cold or intense heat. A fine type of sand loam is perhaps the most desirable soil because it is managed so easily, but it is possible to raise them on clay. A moisture supply is important, but adequate drainage should be provided. The same thorough preparation of the soil should be given for a raspberry plantation as for corn or similar crops, and it is well to have them follow corn or potatoes.

SET RASPBERRIES IN THE SPRING.

Because better plants of the black and purple varieties can be secured in the spring, that is the best season for setting them. Red raspberries, however, may be set in the autumn with good success in sections where the winters are mild, or where there is a good covering of snow to protect the plants.

Plants for setting should have good root systems. In case they are not to be set immediately they should be heeled in, and the roots separated and covered with moist soil. Just before setting it is well to dip the

plants in a puddle made of clay and water, or manure and water. Plants may be set in separate hills, in straight rows, or in hedges. The linear or hedge system is more favored, the plants being set 2 to 3 feet apart in rows which are 6 to 8 feet distant. Before planting, the top portion of all types should be cut back to 6 inches or less in height. The plants should be set slightly deeper than they formerly grew.

From the time raspberry plants are set they need an ample supply of moisture, and they are affected more quickly and seriously when it is deficient than most other fruit plants. In semiarid or arid regions where irrigation is practiced, the fruiting season is longer than in most humid or nonirrigated sections. Irrigation should begin almost as soon after the rainy season as is necessary with garden crops, and should be continued at least until after the picking season is over.

CATCH CROP IN NEWLY SET RASPBERRY FIELDS.

In order to reduce the cost of intensive cultivation of a raspberry plantation during the first year after

setting, other crops that need cultivation during the spring and early summer months may be grown between the rows. Tomato, cabbage, cauliflower, bean, pea, summer squash, and potato crops are recommended. The second season no other crops should be grown.

Tillage in raspberry fields must be thorough and regular. If grass and weeds get a start it is very difficult to clean the rows. The use of fertilizers in raspberry plantations is governed by the same principles that apply to their use with other fruits. Cover crops may be used to maintain the humus supply.

Methods of pruning and training raspberries vary with varieties and localities. Where winters are particularly severe it is sometimes necessary to bend down the canes and cover them with earth or compost during the winter.

Raspberry culture, with particular regard to various localities, is fully discussed in Farmers' Bulletin 887, United States Department of Agriculture. Currant and gooseberry culture is discussed in Farmers' Bulletin 1024.

PLANNING A NEW TOWN.

By Russell V. Black, U. S. R. S.

[In connection with the proposed Snake River development, it is necessary to remove the town of American Falls, Idaho, from its present location in the reservoir site of the proposed American Falls dam to another location above high-water mark when the reservoir is full. Mr. Black has been employed to plan the new town of American Falls and has sent us this interesting statement concerning the results which he expects to accomplish.—*Editor.*]

THE problem of building the new town of American Falls, Idaho, offers an unusual opportunity to control the development of a community from its very beginning. The large majority of the towns and cities in the country have grown in a haphazard manner and are now paying the bills for their mistakes. The chance that was once theirs to develop efficiently, comfortably, and attractively is irretrievably lost. The tremendous cost of this sort of city growth has forced attention throughout the country and the world to the planning of towns, embryonic cities.

It is peculiarly fitting that the Government should recognize the advantages of planning and set this example to private and municipal enterprise.

The direct economic benefits which can reasonably be expected to result from careful planning for the new American Falls are as follows:

First. The large saving in construction costs, resulting from skillfully adapting the streets to the contour of the land, felt in street construction and maintenance, and installation of sewers, water mains, and irrigation ditches.

Second. The most efficient and economic use of the land which has been purchased for the new town site.

Third. The stabilization of real-estate values resulting from the apportionment, by plan, of the various uses in their proper relationship to each other.

Fourth. The avoidance of mistakes that would result in large money expenditure and probably severe criticism of the Government.

Fifth. The good will of the people affected, which will be gained by making the new town attractive, comfortable, and convenient.

Sixth. The increase in value of Government-owned town property which will result, first, from the Government's pride and foresight in building soundly and considerably, and, second, from the actual attractiveness of the town, which can be attained by careful study even in this arid country.

Any one of these advantages would far more than repay for the costs incidental to proper planning.

American Falls, the county seat of Power County, Idaho, is located on a main-line railroad, in the center of a fertile area, now productive through dry farming and possible of much increased productivity through irrigation. It is already a heavy grain-shipping town. There is available unlimited and comparatively cheap electric power, which eventually will attract a certain type of industry such as milling.

It is inevitable that the new town will grow to some proportions. In laying out the new town this probable growth and its likely directions should be taken into consideration.

There is no reason why the ground plan of a modest city of ten or fifteen thousand people should

The planner has proposed to approach the problem. This will be attained through striving for the ad- from this point of view. His first considerations have advantages outlined above. The planner proposes to been economy and simplicity. He has recognized the do the entire work at American Falls and to use the character of the community as a railroad town, the engineering and drafting facilities now maintained social and economic center of a large area of farming there by the United States Reclamation Service. He land. He does not propose an elaborate and highly offers merely the benefits of his training, experience, finished scheme, but aims at a sound foundation, which, and knowledge in the principles of right city building taking into consideration the character of the com- and the difficulties that inevitably arise if these munity, will adequately and happily care for the principles are disregarded.

By Col. Ben Franklin Fly, Yuma, Ariz.

One of the chief advantages in keeping cattle is that they assimilate large quantities of roughage and waste feeds and carry them to market themselves in a more concentrated form. The farmer is thus saved the labor of marketing bulky feed products, and the fertility remains on the farm.

ENGINEERING INVESTIGATIONS.

Rating Stations for Large Irrigation Systems.

By W. G. Steward, Assistant Engineer, U. S. R. S.

IN many of the irrigated sections of the West where the amount of available water is small as compared with the land that could be irrigated if there were sufficient water, and where there are many contending interests striving to secure and maintain rights to the use of water, the proper measurement and distribution of such water become a very complex and serious problem.

On some streams the dates of water-right filings cover a period of 50 or 60 years; they vary in amounts from a few miner's inches to several hundred second-feet, and the number of these filings may be hundreds.

In the distribution of water it is necessary to take into consideration the priority of the right, the amount of water, and the point along the stream where each right is to be delivered.

In the measurement of this water it is apparent that a large number of stations must be maintained and that the location of many of the stations can not be selected so as to be ideal. The proper selection of a station requires consideration of the many factors affecting the movement of the water, and even the most experienced person may often make serious errors due to unknown and varying factors.

It is the object of this article to point out some of the difficulties frequently met and the methods by which they may be overcome.

A measuring station should include a gage, a bridge or other structure from which the measurements can be made, a more or less permanent control, and a good cross section.

The first consideration in the selection of a station should be as to its utility; that is, will it serve the purpose for which it is to be established? After this come accuracy, permanency, and convenience. In most cases canal stations are maintained for a long period of time. The results should be as accurate as possible under the conditions, and it is usually necessary that the station be easily accessible at all times.

The gage is usually located at or near the measuring section. If possible it should be so located that it will not be affected by backwater from checks or other structures, nor by the silting of the canal section. It should be far enough from drops, falls, or head gates so that there will be no change in velocity of approach due to the water passing these structures; that is, the control should be as permanent as possible, so that the gage readings will be affected only by the quantity of water passing the section where it is located.

The gage should be placed so it will not be moved in any way. This may be done by fastening it to a

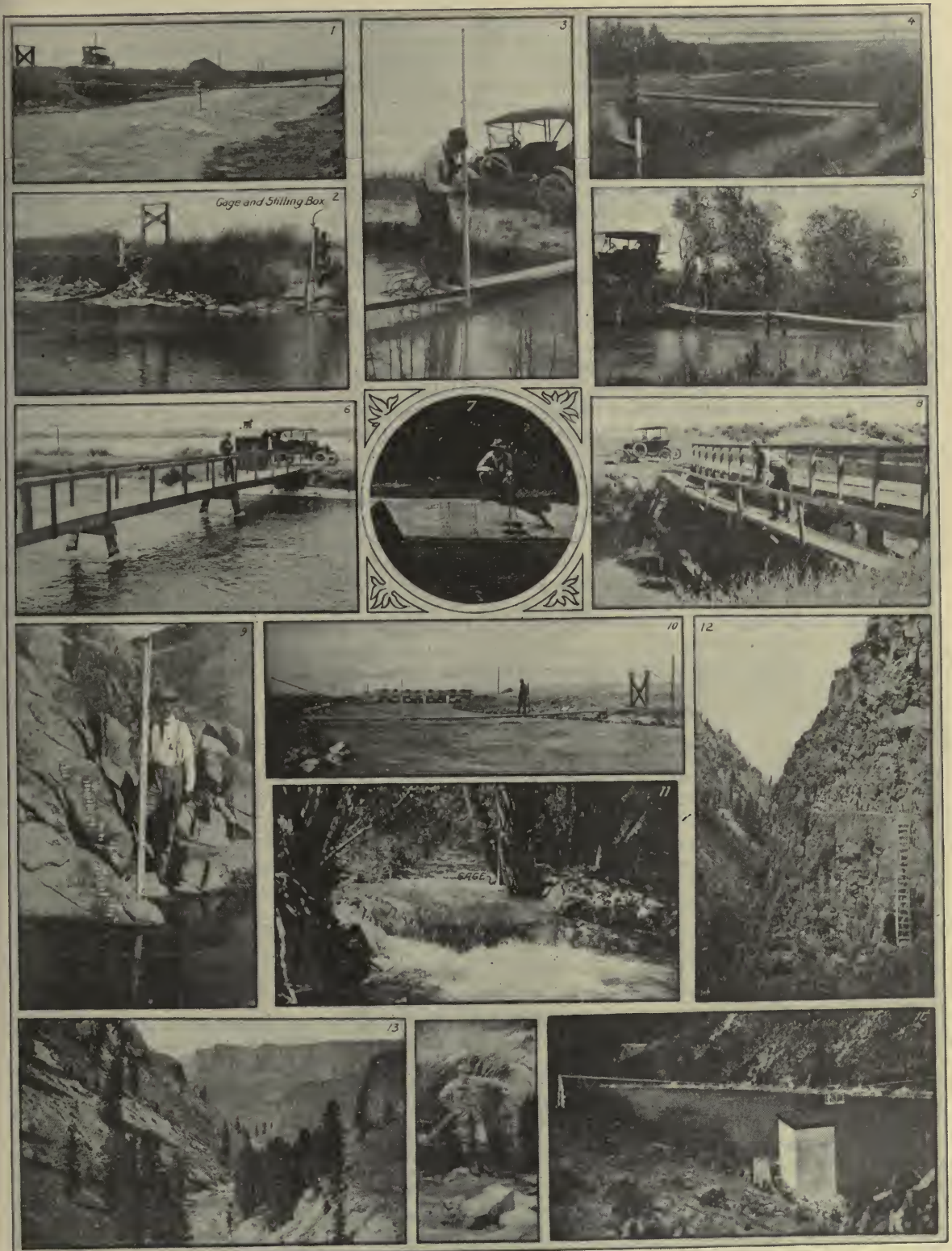
tree that may be growing along the bank, by placing it on a canal structure, by nailing it to posts or yokes set in the ground, or, in some cases, the gage may be cut on rocks along the bank of the stream or canal.

The measuring section should be smooth and as free from rocks, bars, piers, moss, grass, and weeds as possible. It should be so located as not to have a velocity swift enough to create waves as the water passes the section, and, on the other hand, the velocity should not be too low. Velocities between 0.5 foot and 10 feet per second are easily taken. There should be no back flow or whirls in the section.

The type of gage to be used will depend on the conditions under which it is to be installed. Where canals have a concrete lining or have a concrete rating flume the gage may be marked in a section of the concrete when it is being laid or a board may be marked and fastened to the sloping surface. For sloping dirt banks, gages nailed to rectangular yokes set deep in the ground give good results. These should be set well down and fit the ground slope of the bank as nearly as possible. Vertical gages may be fastened to bridge piers or to the face of other structures. Metallic enameled weir scales may often be used to advantage for this purpose. When the water is much disturbed, stilling boxes should be placed around the gage to prevent the fluctuations of the water surface. A slope gage and a stilling box that have given very satisfactory service were described in an article by the writer published in the RECLAMATION RECORD for November, 1918.

The character of bridge to be used at a station will depend largely on the conditions surrounding the station. If the measurements are to be continued for only a short time, it is often possible to use a highway bridge near to where the gage has been located, or, if the water is shallow, wading measurements can be made, but if the station is to be maintained for a long time it is usually better to construct a suitable bridge at or near where the gage is located. The bridges generally used are of three types: The suspension bridge as shown in figures 1, 2, and 10; the single-span timber bridge as shown in figures 3 and 4; the multiple-span timber bridge as shown in figures 5 and 6. This latter type of bridge with piers can be used to advantage only where the section is concreted or is of some solid material that will not erode; otherwise large holes are cut around the piers and the bottom becomes so rough that good measurements can not be made.

Figure 1 shows a suspension bridge across a canal section below a drop where the water is very swift



TYPES OF RATING STATIONS.

and runs in waves. Although the gage located at this point gives satisfactory results, it is believed that the bridge will have to be moved downstream to a point where the velocity is less and the bottom is not so rough. A rough bottom with swift water causes a rough turbulent stream that is very hard to measure.

Figure 2 shows the end of a suspension bridge and a vertical gage and stilling box set in the bank of the canal above the bridge. This picture was taken when most of the water was out of the canal.

Figure 3 shows a single plank across a small canal. Note the rod used for making the soundings. Its position shows the water to be about 3 feet deep. This station is badly affected by the growth of moss and weeds in the summer season. The only thing to do in such a case is to use a correction curve for making the computations during this period.

Figure 4 shows a laminated stringer bridge with a running board nailed on the top. Where there is no danger these single-span bridges can be made 30 to 50 feet between supports if they are stayed on the sides to prevent swinging and buckling. Planks are lapped to form the stringers, the ends are supported by posts, and a running board is nailed on top. A 45-foot span would need four stay wires on each side. The girder can be built of four 2 by 12 pieces of length suitable to make the span. Note the vertical gage set in the canal bank on the left.

Figure 5 shows a two-span bridge over a creek with a hard, rocky bottom. This a good example of the ordinary field construction. The board gage is fastened to a stake that is driven in the ground close to the bank.

Figure 6 shows a long three-span bridge over a large swift canal. The piers of this bridge create considerable disturbance in the water, but by making the meter measurements on either side of the piers their effect is not noticeable. This canal section is concreted; hence the piers do not cause erosion on the bottom. If this section of the canal carried any considerable quantity of ice, a single-span bridge would be necessary, as otherwise it would be carried out by the ice each winter season. The gage for this station is marked on the sloping concrete lining of the canal. When the picture was taken the water was nearly 70 feet across on top and over 8 feet deep, with an average velocity of about 5 feet per second.

Figure 7 shows a canal section with a gage marked into the concrete while it was still fresh and could be easily worked. The concrete in this section constitutes what is known as a rating flume and is only about 50 feet long. The gage was established in 1910 and has been in use ever since; the figures and markings are still in good shape.

Figure 8 shows a footbridge used for measuring. It is extended above the highway bridge to which it is fastened, the object being to get the measuring section

well above the disturbance caused by the bridge piers. A vertical board gage is fastened to one of the bridge piers. Notwithstanding the care taken in the construction of this station, the gage heights were so affected by a check about a mile down the canal that the station had to be abandoned except for special measurements when the check was not in use.

Figure 9 shows a gage cut in the rock along the side of the creek. This is a swift and turbulent stream, and fastening any gage in place would have been difficult. When the station was installed it was not believed that the results would be satisfactory. However, as the control and the gage are permanent, the station has given exceptionally good results. During the low-water season the measurements at this station are made by wading, and at high water they are made at a highway bridge about one-quarter mile below.

Figure 10 is an illustration of a large canal section with high velocities, but with little wave action. There is considerable velocity owing to the water passing through the check above, yet the results at this station have been uniformly good.

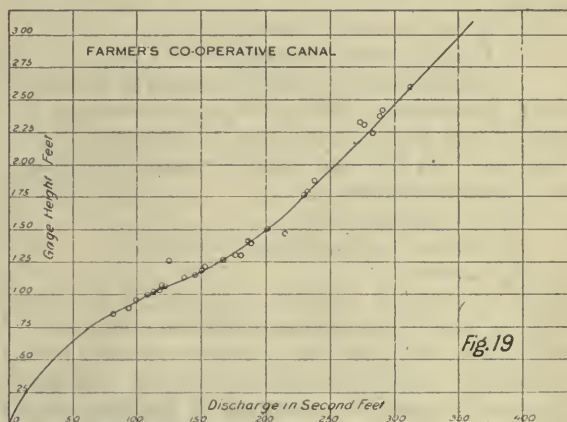
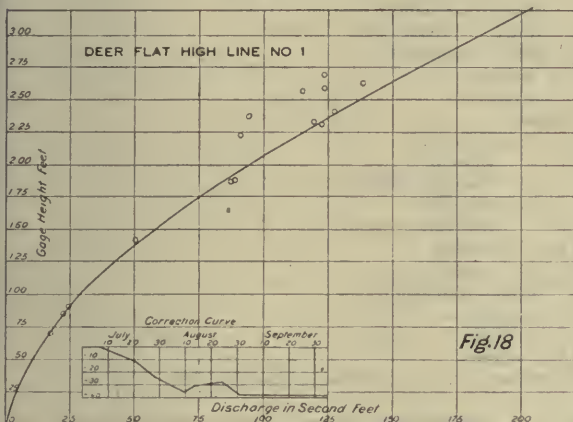
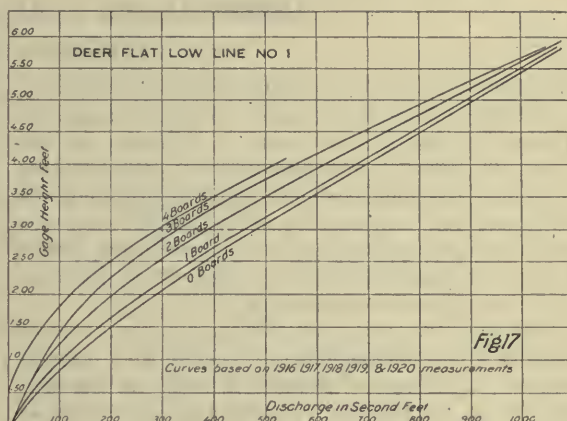
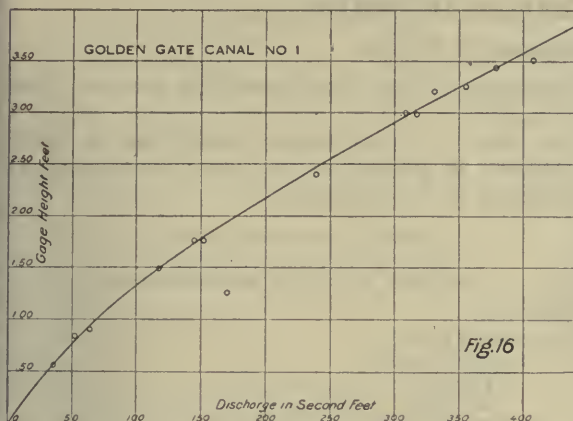
Figure 11 shows a creek section where it was very difficult to get a good section. In this case it was necessary to construct an artificial control, over which the water is seen falling. The gage is fastened to a tree that is growing into the water, and the measurements were made at a point just below the section shown. A large log was placed across the creek and the measurements were made from it.

Figure 14 is a view on a stream on which two or three gages had been taken out by the water during flood periods. The gage seen cut in the rock still remains, though it was established several years ago.

Figure 13 shows a river section on which it was necessary to establish a station, and figure 12 shows a part of the route over which it was necessary that the gage reader and the hydrographer pass every time the gage was read or a measurement was made. Figure 15 shows a river station equipped with a cable and car and an automatic gage and gage house. The isolation of these stations makes them difficult and expensive to operate. It is difficult to get gage readers, and it is necessary to install automatic gages.

Figure 16 shows a discharge curve for an average canal station under good conditions.

Figure 17 shows a set of curves for a large canal station where the discharge is affected by the placing of check boards in a check about 1 mile below the station. The curves are based on a series of measurements extending over a period of five years. The boards are 6 inches in width, and when any change is made in the check the same number of boards is placed in each section of the check across its entire width. With this arrangement the station is giving entire satisfaction.



TYPICAL DISCHARGE CURVES FOR RATING STATIONS.

Figure 18 shows a curve for an average canal station where a checking effect occurs in July, August, and September owing to the growth of moss and weeds in the canal below the station. In order that computations may be made readily during this period a correction curve is used as shown in the figure. This correction curve indicates the amount to be subtracted from the gage reading day by day in order to get corresponding discharge from the station curve.

Figure 19 is a canal curve showing the effect of a double control on the discharge of a station. In this

canal there is a marked drop in the grade about 300 feet below the station. This forms the first control. The second control is a narrow place in a rock cut about one-half mile below the station. Such stations as this require a large number of measurements before the form of the curve can be established, but when it is once known the results obtained may be very good. The station from which this curve was taken has been used for over 10 years without any complaint as to its accuracy.

Any farmer, if he so desires, can do much toward the improvement of his herd by the use of milk scales to determine the production of the individual. Such records can be made more valuable if the Babcock test is also used.

Young stock require considerable care and attention, but usually at a season when the farmer has little else to do. The farmer can well afford to do extra work for them in the winter, as these same animals will assist in harvesting his crops later.

The keeping of farm animals furnishes profitable work during the winter, when other work is less pressing and when they require most care. This distributes remunerative labor throughout the year more evenly than otherwise would be possible.

Eliminating the scrub and mongrel animal, live stock of "no account" family or breeding is one of the greatest improvement steps which possibly could be undertaken by the live-stock breeding and raising fraternity of this country.

INVESTIGATION OF AN IRRIGATION PROJECT.

By Harold Conkling, Engineer, U. S. R. S.

INVESTIGATION of a possible irrigation project is made to determine whether sufficient value will be added to the land to make it profitable to the farmer or settler to pay the cost of the irrigation works plus attendant costs plus a profit to the agency which proposes to install the works. In the case of a project for construction by the Government, direct profit to the agency is neglected, as indirect profit results from increased production.

There are three main questions to which an answer is sought in an investigation, in the following order if possible. If a negative answer to either of the first two can be reached the investigation may cease at that point.

1. Is the land worth irrigating?
2. Is there sufficient water?
3. What will it cost to get the water to the land?

Often the answer to the first is relative and can be answered only after cost has been determined.

Question 1. Is the land worth irrigating?—Factors determining the answer are:

1. Soil quality.
2. Location with reference to market.
3. Climate.

Poor soil quality generally will give a negative answer at once. Combined with adverse conditions in either of the other two items, a negative answer is almost certain. Adverse location and climate with good soil quality require a reservation of judgment until question 3 has been answered. Climate is adverse if too cold or if precipitation is sufficient to produce partial crops.

Question 2. Is water supply sufficient?—Factors by which this can be determined are:

1. Stream discharge near point of diversion.
2. Prior rights below point of diversion.
3. Uncompleted rights above and below.
4. Amount of water demanded by other rights.
5. Amount of water needed by project.
6. Return flow from project.
7. Seasonal variation of discharge, of demands, of return flow.
8. Reservoir available.
9. Ground-water supplies.

Insufficiency of water supply means an immediate negative answer.

Question 3. What will it cost to get the water to the land?—This separates into two items:

1. Diversion works, including pumping carriage and distribution systems.
2. Storage reservoirs.

This necessitates detail field surveys and office studies.

It will be observed that if either of the first two items can be answered in the negative the most ex-

pensive part of the investigation—the surveys—is not necessary.

A variety of miscellaneous information is finally necessary in addition to the above, embracing legal questions, land ownership, etc.

DETAIL OF INVESTIGATION.

Question 1. Is the land worth irrigating?

Gross area.
 Net Irrigable area.
 Character of soil.
 Fertility.
 Alkalinity.
 Texture.
 Rough or smooth.
 Cost of preparation for crops.
 Drainage conditions.
 Natural.
 Artificial.
 Climate.
 Precipitation.
 Annual.
 Monthly distribution.
 Temperature.
 Growing season.
 Crops produced.
 At present.
 Under irrigation.
 Transportation.
 Distance to railroad.
 Local market.
 Conditions on other similar irrigated areas.

Question 2. Is water supply sufficient?

Stream-flow records.
 Near point of diversion.
 At other points in basin.
 On other comparable streams.
 Character of record.
 Run-off characteristics.
 Estimates of run-off.
 Drainage area.
 Character.
 Precipitation.
 Annual.
 Character.
 Intensity.
 Seasonal distribution.
 Rain or snow.
 Prior rights.
 Adjudicated.
 Uncompleted.
 Instituted.
 Water demands.
 Seasonal distribution.
 Return flow.
 Demands of project.
 Soil.
 Open.
 Compact.
 Climate. (See same item under question 1.)
 Crops.
 Other similar projects.
 Conveyance losses.
 Method of irrigation.

Demands of project—Continued.

- Preparation of ground.
- Seasonal distribution.
- Return flow from project.
 - Water diverted.
 - Water consumed.
 - Seasonal distribution.
 - Drainage conditions.
 - Natural.
 - Artificial.
 - Chemical analysis.
- Ground-water supply.
 - Chemical analysis.
 - Depth.
 - Water-bearing strata.
 - Yield.
- Storage.
 - Character of stream discharge.
 - Variation in stream discharge.
 - Annual.
 - Monthly.
 - Daily.
 - Amount necessary.
 - Seasonal.
 - Hold over, wet to dry years.
 - To equalize erratic run-off.
 - Discharge available.
 - Discharge records.
 - Discharge estimates.
 - Prior rights.
 - Precipitation and its character.
 - Evaporation.

Question 3. What will it cost to get the water to the land?

- Diversion works.
 - Kind required.
 - Dam.
 - Direct without dam.
 - Desilting works.
 - Foundation.
 - Type of dam.
 - Material available.
- Main canal.
 - Capacity.
 - Grade.
 - Freeboard.
 - Permissible velocity.
 - Material encountered.
 - Physiography along line.
 - Side drainage.
 - Landslides.
 - Stability of material when wet.
 - Losses from.
 - Lining.
 - Structures.
 - Special.
 - Usual.
 - Waste gates.
 - Flumes.
 - Siphons.
 - Drops.
 - Checks.
 - Sand traps.
 - Spillways.
 - Material.
 - Local.
 - Foreign.
 - Wagon haul, roads, and freighting.
 - Desilting works.
 - Power opportunities.
- Distribution system.
 - Carried to what smallest unit.
 - Pipes.

Distribution system—Continued.

- Open ditches.
- Turnouts, kind.
- Measuring devices, type.
 - Head available for measuring.
- Type of dam.
 - Silt.
 - Quantity carried by stream.
 - Storage for silt.
 - Desilting methods.
 - Power opportunity.
- Pumping system.
 - From stream instead of gravity diversion.
 - Local conditions.
 - Location of pump.
 - On stream.
 - On canal after diversion.
 - Amount water required.
 - Total.
 - At peak.
 - Load.
 - Lift.
 - Maximum load.
 - Power.
 - Direct lift.
 - Electric.
 - Structures.
 - Lining.
- Storage system.
 - Reservoir sites.
 - Location with reference to land.
 - Off stream.
 - On stream.
 - Capacity.
 - Water-tightness.
 - Character of land flooded.
 - Rights of way.
 - Dams.
 - Foundation.
 - Abutments.
 - Height.
 - Kind.
 - Outlets.
 - Sluice gates.
 - Spillway.
 - Location.
 - Capacity.
 - Material available.
 - Transportation.
 - Steam.
 - From wells.
 - Amount available.
 - Kind of power.
 - Lift.
- Silt.
 - Life of reservoir.
 - Storage capacity for.
- Power.
 - At reservoir and below on stream.
 - When available.
 - Market.
 - Cost of reaching market.
 - Transmission line.
 - At diversion dam.
 - On main canal.

Other miscellaneous data.

- | | |
|--------------------------|-----------------------|
| Type of labor available. | Return on investment. |
| Condemnation. | Period of repayment. |
| Interstate conflicts. | Method. |
| Land ownership. | Interest. |
| Legal complications. | Operating costs. |

RESULTS OF OPERATION OF DRAG-LINE EXCAVATORS.

THIS is the first of a series of statements it is planned to issue periodically, every quarter if practicable.

The figures shown in the tables are for canal, lateral, and drain excavation by drag-line excavators for the calendar year 1921 to May 1.

Results of operation of drag-line excavators for the current calendar year of May 1, 1921.

CANAL AND LATERAL EXCAVATION. FIELD COST ONLY.

Project.	Machine.					Excavation.	Number of shifts per month. ¹	Cubic yards per shift. ¹	Shift output based on 1 yard bucket capacity.	Time distribution in per cent.			Unit cost per cubic yard.					
	No.	Power.	Make.	Bucket.	Boom.					Operating.	Repairs.	Delays.	Labor.	Fuel or power.	Miscellaneous.	Plant and equipment.	Total calendar year.	Total to Dec. 31, 1920.
North Platte-Fort Laramie.....	131312	E	B	1 ¹	50	² 93,385	51	533	426	68	31	1	0.023	0.031	0.020	0.030	0.104	0.106
Do.....	131343	E	B	1 ¹	50	³ 132,149	52	626	417	84	15	1	0.022	0.031	0.016	0.030	0.099	0.100
Do.....	131345	E	B	1 ¹	50	⁴ 113,085	54	522	343	84	15	1	0.023	0.033	0.023	0.031	0.115	0.097
North Platte-Interstate.....	122230	G	M	1	45	40,347	26	504	504	83	12	5	0.031	0.023	0.011	0.030	0.095	0.121
North Platte-Northport.....	121471	G	B	2	60	⁵ 26,932	55	442	221	66	32	2	0.035	0.027	0.030	0.073	0.165	0.117
Do.....	131344	E	B	1 ¹	50	⁶ 130,754	52	613	409	83	13	4	0.021	0.043	0.015	0.070	0.149	0.117
Rio Grande.....	121325	G	B	1 ¹	50	57,931	59	315	210	70	17	13	0.036	0.034	0.010	0.030	0.110	0.080
Do.....	121331	G	B	1 ¹	50	63,686	44	475	317	60	24	16	0.029	0.030	0.014	0.030	0.103	0.075
Do.....	121332	G	B	1 ¹	50	76,554	64	300	200	61	21	18	0.037	0.035	0.016	0.030	0.118	0.073
Do.....	121333	G	B	1 ¹	50	59,384	87	404	289	68	12	20	0.032	0.033	0.007	0.030	0.102	0.073
Do.....	121159	G	P	30	30	16,461	32	329	658	80	6	14	0.045	0.020	0.006	0.030	0.101	0.153
Do.....	121160	G	P	30	30	9,871	48	170	340	64	12	24	0.076	0.026	0.021	0.030	0.153	0.188
Do.....	121267	G	B	1	35	15,439	46	206	206	58	24	18	0.053	0.022	0.010	0.030	0.115	0.188
Riverton.....	121322	G	B	1 ¹	50	⁷ 78,866	55	360	240	71	13	16	0.055	0.054	0.025	0.055	0.189	0.245
Do.....	121323	G	B	1 ¹	50	⁸ 44,591	54	208	139	60	15	25	0.101	0.091	0.041	0.076	0.309	0.245
Do.....	121474	G	B	2	60	12,015	17	708	354	77	17	6	0.023	0.038	0.008	0.057	0.126	0.130
Shoshone.....	121161	G	P	30	30	5,141	14	245	490	78	13	9	0.052	0.020	0.009	0.041	0.122	0.130
Klamath.....	122235	G	M	1	40	16,863	64	263	263	73	16	11	0.067	0.037	0.013	0.053	0.170	0.142
Totals and averages: All machines.....						998,595	50	401	371	72	17	11	0.034	0.037	0.018	0.041	0.130	0.142
Electric.....						469,373				80	18	2	0.023	0.035	0.018	0.042	0.113	0.142
Gas.....						529,222				69	17	14	0.045	0.039	0.017	0.041	0.142	0.142

¹ For definition of "shift," see text.

² Includes 750 cubic yards class 2 material.

³ Includes 5 per cent class 2 material.

⁴ 35 per cent class 2 material, 9 per cent class 3. Does not include 19,200 cubic yards rehandled.

⁵ 2 per cent class 2 material.

⁶ 18 per cent class 2 material.

⁷ Includes 4 cents for depreciation of temporary transmission line and substation.

⁸ 74 per cent class 2 material, 0.1 per cent class 1. Material rehandled or excavated outside of canal prism amounts to about 6,000 yards additional.

⁹ 6 per cent class 2 material, 69 per cent class 3. Material rehandled or excavated outside of canal prism amounts to about 6,000 yards additional.

DRAIN EXCAVATION. FIELD COST ONLY.

Grand Valley.....	122227	G	M	1	40	40,840	56	181	181	41	53	6	0.052	0.045	0.017	0.035	0.149	0.119
Do.....	122228	G	M	1	50	44,376	58	231	231	58	31	11	0.045	0.032	0.020	0.035	0.132	0.151
Do.....	122238	G	M	1	45	82,618	56	369	369	72	22	6	0.033	0.025	0.010	0.035	0.108	0.106
Do.....	121156	G	P	30	30	26,557	55	196	392	60	30	10	0.049	0.022	0.014	0.051	0.136	0.136
Huntley.....	121163	G	A	45	45	¹⁰ 7,270	24	148	395	81	13	6	0.097	0.041	0.016	0.067	0.221	0.221
North Platte-Fort Laramie.....	121150	G	A	30	30	¹¹ 15,794	22	179	358	71	20	9	0.085	0.032	0.049	0.074	0.240	0.240
Do.....	131313	E	B	1 ¹	50	154,430	52	738	492	81	15	4	0.021	0.031	0.013	0.030	0.095	0.105
North Platte-Interstate.....	121157	G	P	30	30	34,190	75	300	600	78	7	15	0.047	0.014	0.012	0.043	0.116	0.116
Rio Grande.....	121325	G	B	1 ¹	50	32,541	33	925	617	72	10	18	0.018	0.017	0.004	0.030	0.069	0.080
Do.....	121331	G	B	1 ¹	50	33,098	54	613	409	60	24	16	0.020	0.023	0.013	0.030	0.086	0.075
Do.....	121333	G	B	1 ¹	50	¹² 70,601	35	844	563	69	11	20	0.019	0.020	0.005	0.030	0.074	0.073
Do.....	121334	G	B	1 ¹	50	142,319	57	617	411	61	19	20	0.025	0.022	0.014	0.030	0.091	0.074
Do.....	122239	G	M	1	40	62,049	44	344	344	67	8	25	0.031	0.023	0.007	0.030	0.091	0.091
Do.....	122340	G	M	2 ¹	55	¹⁴ 198,863	44	1,131	452	70	14	16	0.014	0.018	0.005	0.030	0.067	0.067
Shoshone.....	121153	G	P	30	30	7,495	25	300	600	68	22	10	0.060	0.012	0.014	0.034	0.120	0.120
Do.....	121472	G	B	2	60	28,384	38	747	372	66	20	14	0.019	0.024	0.031	0.049	0.123	0.123
Do.....	121324	G	B	1 ¹	50	50,201	70	478	319	65	15	20	0.033	0.029	0.021	0.038	0.121	0.097
Do.....	113210	S	L	1	50	18,409	42	438	438	77	11	12	0.049	0.028	0.049	0.020	0.146	0.180
Do.....	12426	G	M	1	40	11,594	47	220	220	70	15	15	0.060	0.029	0.058	0.051	0.198	0.236
Do.....	11128	S	B	1	50	12,544	57	213	213	50	16	34	0.096	0.114	0.019	0.031	0.260	0.290
Yuma.....	121420	G	B	2 ¹	60	79,650	25	796	319	57	30	13	0.015	0.012	0.014	0.018	0.059	0.105
Do.....	12429	G	M	1	40	30,185	52	146	146	36	62	2	0.028	0.023	0.024	0.041	0.116	0.131
Totals and averages.....						1,184,018	46	462	384	65	21	14	0.028	0.024	0.013	0.034	0.099	0.142

¹⁰ Includes 1,790 cubic yards canal embankment.

¹¹ Wasteway No. 4. Does not include 1,879 cubic yards rehandled.

¹² Includes 6,804 cubic yards of lateral excavation.

¹³ Includes 15,190 cubic yards of lateral excavation.

¹⁴ Includes 16,007 cubic yards of lateral excavation.

Drainage excavation in most cases consists of the excavation of open ditches from 8 to 12 feet deep with $1\frac{1}{2}$ to 1 side slopes and bottom width 8 to 12 feet. The yardage reported is to the neat lines only of the designed section. On account of the character of material the actual quantity moved is usually greater than that shown.

Canal and lateral excavation figures are for canals and laterals with bottom width varying from 65 feet to 16 feet and with cuts from 10 feet to 2 feet. The yardage reported is to the neat lines only of the designed section. In some cases the work consisted largely of embankment from borrow pits along the side of the canal.

The costs in all cases are for machine operations only, excluding the cost of drilling, blasting, engineering, general superintendence, general expense, etc.

All figures are for the calendar year only, except those in the last column; where the unit costs prior to the current year are given for purposes of comparison and represent all the excavating work by the machine of whatever character that had been reported to the end of 1920. For example, on the Rio Grande project most of the work previous to this year has been on drains, so that the comparison between previous and present unit costs is for most of the machines a comparison between the costs of canal and drain excavation.

The quantities usually include small amounts of other kinds of excavation, such as structure backfill, road building, etc., incidental to the main work, but these amounts are in all cases relatively small in proportion to the totals. Where it was impossible to separate entirely canal from drain excavation this has been specifically noted.

The charges for depreciation of plant and equipment are generally higher per cubic yard in the case of the machines recently purchased on account of their greater costs. Depreciation for the new machines has usually been figured from a fixed charge per shift, so that the charge per cubic yard excavated will vary from month to month, whereas the older machines carry depreciation charges at a fixed amount per cubic yard, which will under normal conditions mean a uniform monthly charge per cubic yard. These charges not only cover depreciation on the machine and repair parts, but also take care of the cost of erection, moving on to the work, major repairs, erection of temporary transmission lines, etc.

The figures in the column entitled "shift output based on 1-yard bucket capacity" are obtained by dividing the cubic yards per shift by the capacity of the bucket in cubic yards. This forms an approximate basis for comparing the unit production of machines of different capacities, which in conjunction with the unit cost per cubic yard gives to a limited degree an idea of the efficiencies of the various ma-

chines. Such comparisons are of more value in the case of drain excavation, where the work is more uniform, than in canal excavation, where there is a much wider variation in material and controlling conditions.

A shift represents eight hours of work by the crew. Unit cost and production figures are based on the total number of shifts the crew is engaged on the machine, including moving up, repairing, waiting for supplies, etc.

The material excavated is class 1, except as noted.

The symbols are explained as follows:

Make.—A=Austin; B=Bucyrus; L=Lidgerwood; M=Monighan; P=Pawling & Harnischfeger.

Power.—E=electric; G=gas; S=steam.

Bucket.—Under "bucket" the figures refer to the capacity in cubic yards.

Boom.—Under "boom" the figures refer to the length of boom in feet.

CONGRATULATIONS TO SECRETARY FALL.

The Dona Ana County Farm Bureau, Rio Grande project, adopted the following resolution on the occasion of the Fifth Annual Farm Bureau Day:

"The Dona Ana County Farm Bureau, representing the progressive element of the county regardless of political affiliations, on the occasion of their fifth annual meeting desires to congratulate and extend hearty felicitations to the honorable Albert Bacon Fall, formerly of this county and esteemed as a fellow countryman, on his appointment to the position of Secretary of the Interior.

"It is indeed proper and pleasing to his many friends and admirers that a western man has been placed in this position of vast scope, power, and importance to the West, and particularly the Southwest. The development of the incalculable resources of the West in hydroelectric power, mining, grazing, and reclamation of arid land is one of the greatest tasks ever faced by mortal man.

"The Dona Ana County Farm Bureau desires to express at this time its supreme confidence in the ability of Secretary Fall to handle this stupendous work to the satisfaction of the people, honor to himself, and glory to the Nation.

"We desire especially to praise the work of the United States Reclamation Service in this valley in protecting our water rights from infringement, providing the greatest water supply in the West, saving us from the seep water, and making this the garden spot of the West.

"Particularly do we desire to thank the Reclamation Service and its director, A. P. Davis, for the large appropriations, rapidity of drainage operations, and many other similar favors shown this district."



West Side Irrigating Co. Case.

IN 1905, just prior to the adoption by the Government of the Yakima irrigation project in Washington, the West Side Irrigating Co. executed an agreement limiting its right to the waters of the Yakima River to 80 second-feet from April to September. It continued, however, to divert 105 second-feet. Suit was brought by the United States to enjoin the company from taking water in excess of the amount specified in the limiting agreement, and in this litigation the contentions of the United States were upheld. (230 Fed., 284; 246 Fed., 212; 264 Fed., 538.) The State engineer of the State of Washington sought to limit the company to the amount of water to which it was entitled under its agreement as interpreted by the Federal court. The company brought action to enjoin the State engineer, and the questions involved were recently decided by the Supreme Court of the State of Washington against the contentions of the company. (*West Side Irrigating Co. v. Chase*, 192 Pac., 892; 196 Pac., 666.) The following points were decided by the court:

Water Code, sections 1, 5, 8, 10, undertakes, among other things, to control prior appropriations of water, and gives the State hydraulic engineer authority to issue or enforce an order that an irrigation company take no more waters from a river than the amount provided for in a limiting agreement entered into by it and approved by the Federal courts; the hydraulic engineer in so doing not acting in a judicial capacity.

Decree of the Federal district court, approving an agreement limiting in their rights users of the waters of a river, enforced and affirmed by the circuit court of appeals, was a valid, subsisting judgment, and so remained until set aside or modified by proceedings for such purpose.

The statute of limitations can have no effect in favor of an irrigation company claiming the right to use waters of a river as against the State hydraulic engineer seeking to enforce a decree of the Federal district court limiting the rights of the company in accordance with an agreement entered into by it.

The rights of an irrigation company to waters of a river having been adjudicated, pursuant to a limiting agreement which it made, by the Federal district court, and, on appeal, by the circuit court of appeals, the State hydraulic engineer, under the Water Code, has power to enforce such adjudication as against the company, the engineer not strictly enforcing the decrees of the Federal courts, but enforcing a right which the Federal courts have determined to exist.

Discretion of Secretary Relative to Public Lands.

The action of the Secretary of the Interior in deciding a question relative to public lands, which was within his jurisdiction, can not be reviewed by the courts, even if erroneous, unless the Secretary acted arbitrarily. Where a purchaser of public lands had relinquished his rights thereto because of a claimed shortage in the acreage, knowing of a ruling that such relinquishment became effective immediately without action by the office, a ruling by the Secretary of the Interior that such relinquishment terminated all the purchaser's rights, and that the application could not be renewed after the land was entered by another, was not so unreasonable as to be arbitrary, and can not be reviewed by the courts in mandamus proceedings. If the Secretary of the Interior has erred in his rulings relating to an application for public lands, a court of equity can, after patent is issued to the successful applicant, vindicate whatever rights the unsuccessful applicants may have. (*United States ex rel. McCullough et al. v. Lane*, Secretary of the Interior, 269 Fed., 202.)

Care Required of Ditch Owners.

Ditch owners are bound to exercise only ordinary care in the construction and maintenance of their ditches. An owner of land lying below an irrigation ditch can not recover for damages caused by seepage without showing that the ditch was negligently constructed or operated. In action to restrain operation of irrigation canal and to recover damages sustained by reason of negligence and improper construction and operation of canal, it will be presumed that the canal was properly constructed. Negligence is never presumed. (*Longmire et al. v. Yelm Irr. Dist.* (Wash.), 195 Pac., 1014.)

Powers of Irrigation Districts and of Taxpayers Within Them.

All the powers granted an irrigation district must be exercised by the board of directors, unless they are denied the right to exercise the power or it is reserved to the electors, and powers and discretion in the matters of making contracts for the construction of reservoirs, etc., are not granted to the individual taxpayers or to the court, and they can not interfere

with discretion exercised by the board or the district upon a referendum vote of electors. Where discretion may be exercised by a municipality, it must be done by constituted authority, and the courts can not at the instance of a taxpayer interfere with the exercise of such discretion or substitute the judgment of the court for the judgment of those in authority. A taxpayer may protect the rights of a municipality against the unlawful increase of taxes, which would throw an unlawful charge or burden on his property, but he can not, by the exercise of discretionary powers vested in others, force additional burdens and taxes on the municipal taxpayers. A taxpayer of an irrigation district, as a rule, in the absence of fraud, has no capacity to bring an action for the district against the will, discretion, and judgment of the board and the district in whom are vested by statute the power and authority to exercise such judgment, nor can the court exercise the discretion vested by law in the board or the electors, and where it is discretionary with such board to carry out or abandon a contract with a third party, a taxpayer can not compel its enforcement. (*Antero & Lost Park Reservoir Co. v. Lowe* (Colo.), 194 Pac., 945.)

Appropriation of Water in Utah.

Persons claiming water in a stream can not be affected by any decision of the State engineer on application for an appropriation of alleged unappropriated waters when they are not before the engineer and have asserted no claim adverse to the interests of the applicant, and hence the applicant can not be required by the State engineer to go into court and judicially establish the fact that there are unappropriated waters every time there may be a conflict or question between the applicant and the State engineer upon such fact, under laws 1919, chapter 67, Compiled Laws 1917, sections 3454, 3455, 3542, 3543, and where the State engineer rejected an application merely because he was of the opinion that there were no unappropriated waters in the stream in question, the applicant could proceed against him by petition under Laws 1919, chapter 67, section 65, without making other users of water on the stream parties; no protests having been filed. (*Brady v. McGonagle*, State Engineer, 195 Pac., 188.)

Effect of Judgment Confirming Irrigation District Proceedings.

A party failing to appear and file an answer in irrigation district confirmation proceedings is estopped from questioning the judgments and in no position to draw from the supreme court on appeal therefrom an opinion on questions of fact involving the regularity, validity, and legality of the proceedings, his failure to answer being an admission of the material allega-

tions, and the judgment is conclusive upon land-owners whether appearing or not. (*In re Walker River Irr. Dist.*, *Hendrich v. Walker River Irr. Dist.* (Nev.), 195 Pac., 327.)

Abandoned Water Rights.

There can not be an innocent purchaser of an abandoned water right; for, although tangible things, though abandoned, still exist, a water right is intangible, and, once abandoned, has no existence in fact or theory. (*Terrace Irr. Dist. et al. v. Overflow Ditch No. 1 et al.* (Colo.), 195 Pac., 325.)

Litigation Affecting the Horseshoe Reservoir Site in Arizona.

The Verde Water & Power Co. was incorporated in 1901 under the laws of the State of Arizona for the purpose of developing hydroelectric power for distribution and sale and impounding the waters of the Verde River at the Horseshoe Reservoir site and irrigating arid lands therewith. The company claimed an easement in said reservoir site under section 2399, Revised Statutes of the United States, and paragraphs 5337 and 5338, Revised Statutes of Arizona, 1913. This claim was based upon a number of notices of appropriation of the reservoir site and the waters of the Verde River, the first of which was posted August 5, 1901. The company claimed to have expended about \$600,000 in the enterprise. On July 27, 1903, the Secretary of the Interior withdrew, in connection with the Salt River Federal irrigation project, the public lands embracing the Horseshoe Reservoir site, under the first form of withdrawal authorized by section 3 of the act of June 17, 1902 (32 Stat., 388). The Salt River Valley Water Users' Association, representing the water users upon the Salt River project, claimed an interest in this reservoir site, and the Verde Water & Power Co. brought suit in the Superior Court of Maricopa County, Ariz., to quiet title to the site. Plaintiff's complaint was dismissed by the trial court, and upon appeal to the supreme court of the State the judgment of the lower court was affirmed. (*Verde Water and Power Co. v. Salt River Valley Water Users' Ass'n et al.*, 197 Pac., 227.) The following is taken from the syllabus of the opinion of the appellate court:

The laws of the United States in reference to the disposition of public lands of the United States are paramount and exclusive, and a water and power company could not acquire an easement on lands of a reservoir site, withdrawn from entry by the Secretary of the Interior, by virtue of any compliance with Civil Code, Arizona, 1913, paragraphs 5337, 5338.

Under the act of June 17, 1902 (32 Stat., 388), the Secretary of the Interior had authority to withdraw from public entry lands constituting a reservoir site sought to be appropriated by a water and power company.

The official acts of the Secretary of the Interior of the United States are presumed to have been right and regular and free from fraud.

The rule that the right to an easement for a reservoir, ditch, or canal over the public lands, claimed under United States Revised Statutes, section 2339, relates back to the commencement of the work or notice of appropriation, provided the work is prosecuted with due diligence, has no application as against the United States.

As to the Federal Government, prior to final completion of its reservoir, a water and power company, seeking to acquire title to the reservoir site under United States Revised Statutes, section 2339, was acting under a revocable permit or license, and can not be heard to complain if the permit or license was withdrawn, even if a large sum of money had been expended in the enterprise in expectation of obtaining title; and the State court, in the company's suit to quiet title to such reservoir site, can not say the Secretary of the Interior acted unjustly in making withdrawal of the site, though it may believe hardship was inflicted on the company; the Secretary's discretion being absolute in the absence of fraud.

Severance of Water Right from Ditch Right.

The owners of a ditch may convey the ditch to another, separate from their right to the water for the irrigation of their lands which had been previously carried in the ditch. Where such owners conveyed such ditch to an irrigation district to enable the latter to construct its canal along the line of the ditch, which necessitated destruction of the ditch, a reservation merely of the water right of the grantors did not carry with it the right to use the ditch to convey the reserved water to the lands of the grantors. To retain a right to use the ditch a specific reservation is necessary. (*Marks v. Twohy Bros. Co (Oregon)*, 194 Pac., 675.)

Subterranean Water.

In a suit to determine the right to water drawn from inside a mountain by means of a tunnel and flowing into a stream, as between the owner of the tunnel and a prior appropriator of the water of the stream, the former has the burden of proof to show that such water is not seepage or percolating water from the surface, which, but for the tunnel, would otherwise have been tributary to the stream. (*Midway Irrigation Co. et al v. Snake Creek Mining & Tunnel Co.*, 271 Fed., 157.)

Right of Landowner to Protect His Property from Flood Waters.

Relative to the right of a landowner to protect his property from flood waters, the Supreme Court of the State of California has decided as follows in the case of *Horton et al v. Goodenough et al.*, 194 Pac., 34, to wit:

One has no right to obstruct the flow onto his land of what are technically known as "surface waters," but the term does not include all waters which may be on or moving across the surface of the land without being collected into a natural watercourse, being confined to waters falling on the land by precipitation or arising thereon in springs.

One has the right to protect himself and his land against "flood waters," that is, waters escaping from a natural watercourse in time of flood or overflow, and for such purpose may obstruct the flow onto his land, even though such obstruction causes them to flow onto land of another.

One may not obstruct or divert the flow of a natural watercourse, "watercourse" not meaning the gathering of errant waters while passing through a low depression, swale, or gully, but a real stream, with a definite channel, with bed and banks, within which they flow at the times when the streams of the region habitually flow.

Where a stream coming out of the mouth of a canyon has left a cone of detritus and flows down one side thereof, but in a time of high water it breaks out of its channel to flow down the other slope of the cone, such waters are flood waters running wild, and any property owner threatened thereby has the right to protect himself against them as best he can, the waters not being "surface waters" in the technical sense, it being immaterial that the escaping waters have made for themselves a channel or follow some natural channel, gully, or depression, to come to defendant property owner, who has protected himself against them, as a stream, instead of spreading out over the ground.

Nevada Irrigation District Act Held Constitutional.

The Nevada irrigation district act was held constitutional by the supreme court of the State in the case of *Hendrich v. Walker River Irr. Dist.*, 195 Pac., 327.

Bills Introduced in Congress.

IN THE HOUSE.

H. R. 6352.—"A bill for the relief of Katherine MacDonald," introduced May 18, 1921, by Representative Washington J. McCormick, of Montana.

H. R. 6373.—"A bill authorizing an appropriation for the payment of the portion of the cost of the Big Bend drainage district of Riverton, Wyoming, applicable to Indian lands," introduced May 20, 1921, by Representative Frank W. Mondell, of Wyoming.

H. R. 6870.—"A bill granting homesteads to soldiers, sailors, and marines upon proof of sixty days' residence," introduced June 6, 1921, by Representative C. B. Hudspeth, of Texas.

H. R. 6877.—"A bill to permit a compact or agreement between the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming, respecting the disposition and apportionment of the waters of the Colorado River, and for other purposes," introduced June 6, 1921, by Representative Frank W. Mondell, of Wyoming.

H. R. 6992.—"A bill to amend an act entitled 'An act for the relief of homestead entrymen or settlers who enter the military or naval service of the United States in time of war,'" introduced June 9, 1921, by Representative Carl W. Riddick, of Montana.

H. R. 7059.—"A bill to confer jurisdiction upon the Court of Claims to ascertain the cost to the Southern Pacific Company, a corporation, and the amounts expended by it from December 1, 1906, to November 30, 1907, in closing and controlling the break in the Colorado River, and to render judgment therefor," introduced June 10, 1921, by Representative Henry Z. Osborne, of California.

IN THE SENATE.

S. 1820.—"A bill to provide for Federal cooperation for increasing the productive agricultural area of the

United States by the reclamation of swamp and arid lands therein," introduced May 16, 1921, by Senator Park Trammell, of Florida.

S. 1896.—"A bill to create the Department of Public Works and Public Lands, and for other purposes," introduced May 26, 1921, by Senator Medill McCormick, of Illinois.

S. 2014.—"A bill to provide for the settlement of small holding claims on unsurveyed land in the State of New Mexico," introduced June 9, 1921, by Senator Holm O. Bursum, of New Mexico.

—Ottamar Hamele.

FILING SYSTEM FOR THE FARMER AND ENGINEER.

By S. L. Sinclair, Engineer, Minidoka Project, Idaho.

IT is very generally recognized that a collection of clippings from technical and other magazines and papers is of great value if the clippings are filed in such a manner as to be readily accessible.

For several years I collected clippings and other engineering data and had the usual difficulty in arriving at an adequate system of filing. I first tried pasting the clippings in a scrapbook, a method which proved unsatisfactory and inadequate owing to the time required for filing and the necessity of a separate index, in addition to the fact that such a book is soon filled and becomes unwieldy. I next tried filing in envelopes, and this was not satisfactory, as too many envelopes are required if the clippings are to be thoroughly segregated.

The method finally adopted requires the use of a standard filing cabinet, as illustrated, with 6 by 9 inch drawers.

A page from a standard technical or similar magazine usually measures 9 by 12 inches and when trimmed and folded once will fit a 6 by 9 inch drawer. A full-size index card is used for each subject and when a clipping covers more than one subject and does not permit separation, in some cases the subject matter of each being on opposite sides of the clipping, a separate card is filed to cover one of the articles on the clipping. The data on the card cover the subject matter of the clipping and show under what subject the actual clipping is filed.

For example, a clipping with reference to "Testing water wheels after installation" has on the reverse side an article relative to "Standard colors for power station piping." The clipping is filed under WATER WHEELS and a separate card is filed under PIPING SYSTEMS. On this card is written: Standard colors for power station piping; filed under WATER WHEELS; see Testing after installation. In the case of small clippings they are pasted on 6 by 9 inch cards, which are filed in the usual manner.

A cross index is used when necessary to list or index a single clipping requiring more than one key word or title.

In a six-drawer file I now have approximately 600 index cards with subject matter. The last twenty and odd cards are indexed as follows:

Water, water hammer, water measurement, water motors, water power, water proofing, water treatment, water wheels, weighing machinery, weights and measures, welding, wells, winches, wire, wire prices (this on a blue card), wiring, wiring diagrams, wiring prices (this on a blue card), wiring rules, wiring tables, wood working, vehicle equipment, zinc. In some cases a large amount of data may be filed under a single card.



Standard filing cabinet for clippings.

Innumerable valuable articles are read and forgotten which, if filed, would be of great value for future reference. In such cases it is generally impractical to retain the entire magazine or paper on account of the large accumulation that would result, and if retained it is of little value owing generally to lack of an index.

EL PASO—PROJECT TOWN AND METROPOLIS OF THE REAL SOUTHWEST.

By J. E. Sater, Rio Grande Project, New Mexico-Texas.

IN explanation of the subject chosen by the writer, a few comments upon what constitutes a "project town" and the "real Southwest" might not be out of order.

In the same manner that the seat of government of a nation became known as a national capital, of a State the State capital, of a county the county seat, so, also, have we come to speak of the town where the headquarters office of a reclamation project is located as the project town. El Paso is the project town for the Rio Grande project.

People of a certain section of the country also speak of a particular town as the metropolis of that section. Thus, we have often heard such expressions as "Denver, the metropolis of the West;" some have even claimed for this distinction Chicago; and in the East, one often hears Kansas City spoken of as the metropolis of the Southwest; or the enterprising Pacific coast business man may refer to Los Angeles as the "big town" of the Southwest. But ask any southwestern man what the metropolis of the real Southwest is, and he will tell you "El Paso!"

With these few explanatory remarks, the remainder of this article will be about El Paso and the real Southwest.

Situated on the Rio Grande, about midway between the headwaters of this river and the Gulf of Mexico, is El Paso, a city of approximately 100,000 people (including suburbs and Fort Bliss), located on four transcontinental railroads. The city is proud of its more than 100 miles of paved streets and numerous manufacturing and jobbing enterprises.

Possibly a more interesting discussion of the city might be had by viewing it as a stranger would. Following out this theory, we find a stranger coming into El Paso, and we notice his amazement upon arrival at the Union Station, where he begins immediately to feel the busy atmosphere of a hustling city. Such a feeling is no doubt accentuated because of the fact that he has traveled over many miles of barren land before reaching El Paso, and, too, for the reason that he has never heard much of the Southwest except as a cattle range.

We follow this same stranger to a million-dollar hotel, where, after a little rest from his long ride on the train, he becomes more talkative. One of his first remarks is, "What a fine day!" We assure him that it is just one of about three hundred and twenty-five of such days as are seen every year in this section, for the climate of El Paso must be spoken of as among its important assets. When other sections of the country are suffering from tornadoes, snowstorms, and other climatic vicissitudes, the weather man sends only a stiff wind to admonish El Pasoans that they are getting off easy and that things might be worse.

In order that our stranger friend (notice how quickly he becomes our friend) can get a good glimpse of El Paso, we take him in a car over the recently completed scenic driveway around the side of Mount Franklin, from which location we look down several hundred feet upon the 10 square miles of incorporated area within the city. As we stop our car at a favorable point, we need not point out the rich green valley up and down the Rio Grande, and contrast it with the brown desertlike land on both sides of it, for he has noticed this. But we do mention that from the point where we have stopped we can look down upon two nations, three States, and two cities: the United States and Mexico; Texas, New Mexico, and Chihuahua; and El Paso and Juarez, respectively.

Having moved around the side of the mountain a little farther, our friend calls our attention to a group of substantial buildings and inquires whether they are a part of Fort Bliss. He has probably heard about Fort Bliss and knows that it is on the outskirts of El Paso, because this military post has for a long time been known as a permanent station for a part of Uncle Sam's standing army, with nearly all branches represented. We inform him that we are proud of Fort Bliss, and that we consider it one of our biggest institutions, even in time of peace.

However, lest he should misunderstand our last remark to mean that we have no big industries, we make our trip around Fort Bliss a hurried one, for we want him to be sure to see, among other plants, that of the big cement company, and also the largest customs smelter in the Southwest. Both of these are located on the other side of El Paso. We do stop long enough on our way across the city to show him El Paso's high-school building, with its stadium capable of seating about 12,000 people. This magnificent building, said to rank third among those in the United States, would probably cost \$1,000,000 if built under the present-day high costs. And while speaking of buildings, we tell him not to let us forget to show him El Paso County's stately courthouse, which was erected when building costs were within reason, at a cost of about \$900,000.

So from place to place, we go with our newly acquired friend, and having covered the city and pointed out what we thought were some of the most interesting reasons for becoming a citizen of El Paso, we turn to him and ask what, if anything, has impressed him more than anything else. He tells us that it is one thing that we have not mentioned—the almost complete absence of frame structures, practically all building being done with brick.

The example chosen, of the stranger coming to El Paso, is typical of many who come here to spend the winter. That large numbers of them go back

home and return later with their families is evident by the 114 per cent increase in the city's population during the last 10 years. Every day brings inquiries to the chamber of commerce from manufacturers who are seeking new trade outlets. The most conservative business men of the city predict that El Paso's population will increase to 150,000 within the next 10 years; and those more optimistic feel certain that 250,000 will be nearer the 1930 census figure.

But, keeping pace with the growth of El Paso as an industrial center, agriculture is coming in for its share of the laurels. Although, perhaps, the oldest irrigated section of the United States, modern irrigation came only with the activities of the Reclamation Service in the construction of the Rio Grande project. The "land of the mañana (to-morrow)" has already given way to modern irrigation methods, and with the Rio Grande project nearing completion, great possibilities for the future part that agriculture is to play in the development of the land in Texas and New Mexico contiguous to El Paso are rapidly becoming a reality.

The Rio Grande project comprises an area of approximately 150,000 acres, of which 45,000 acres are in Texas and the remainder in New Mexico. As a part of the project, in 1915 the Elephant Butte Dam was completed by the Reclamation Service in New Mexico, about 125 miles up the river from El Paso. The reservoir formed by the construction of this dam has a capacity of about 2,600,000 acre-feet of water, and during the last four years has proved its value by preventing a drouth one year and what would have resulted in serious floods another year. And now, El Paso, realizing that she has in her very backyard a big resource like the Elephant Butte Dam, is endeavoring to determine the full value of the reservoir to the city by investigating its worth for the furnishing of power and as a source of water supply for the city.

The old axiom that there is always a cause and an effect is true in the case of El Paso and the real Southwest. Many tributes could be paid to the unfaltering courage of those rugged pioneers who saw the possibilities that would be offered by a town situated as is El Paso (The Pass), but these are written down in the history of the city, and to say much in this connection would make another long story. It is quite enough to say, in conclusion, that the hardships endured by these men attracted the attention of other red-blooded Americans from the North, from the East, from the South, and from the West, and these men told their neighbors from these different sections about the wonderful opportunities offered by the "Pass City," so that to-day the population of El Paso and the real Southwest is not all southern, all western, or of any other one kind, unless it might be said "Southwestern."

MAY WEATHER IN THE WESTERN STATES.

By P. C. Day, United States Weather Bureau.

May, in the Western States, was mainly cooler and wetter than the average conditions of the month, but in many districts east of the Divide or near the northern border the month was warm or dry, or both. West of the Divide the warmest weather came chiefly between the 10th and the 16th, or during the last 10 days of the month, but east of the Divide it was warm during part of the first week, and in the more northern portions about the 20th. The notable cool weather east of the Divide occurred about or just before the middle of the month, also in some portions it was especially cool during the first three days. West of the Divide it was particularly cool during the first week in about all districts, then in central and southern districts for about a week, beginning the 16th, but in northern districts around the 27th. The whole month averaged within 2° of normal temperature in most districts, but in the interior counties of California mainly from 3° to 5° cooler than normal.

From about the 5th to the 8th rain reached most central and southern districts to westward of the Divide, and during the third week of the month rains reached most districts near or to eastward of the Divide and many central districts to westward, also much of southern California. The rains that occurred at other times were less widely distributed. In some elevated portions of Wyoming, southern Nevada, and southern Utah there was comparatively large snowfall for so late in the season. The month's precipitation was generally much above normal in southern California and from northeastern California and eastern Oregon eastward to central Wyoming; elsewhere it was usually not far from normal, save that between latitude 45° and the Canadian border it was mostly much less than normal, and likewise in the central and southern plains.

Conditions were, on the whole, as favorable as usual for outdoor work, and generally were fully as favorable for live stock as usual, save that near the Mexican border the prolonged shortage of precipitation has resulted in severe scarcity of feed and of water, with considerable stock losses. The weather was mainly favorable for small grains and for truck, though in some portions it was too dry for best progress. Truck suffered slightly in localities from frost, and there was some frost injury to fruit also, but in the main, conditions were good for fruit.

There is no possible reason why farmers and stockmen should waste their time and tie up and jeopardize their capital in the purchase and feeding or breeding of inferior stock. The supremacy of the better bred animals is practically infallible.

MONTHLY PROGRESS REPORTS FOR MAY, 1921.

Monthly conditions of principal Reclamation Service reservoirs for May, 1921.

[Elevation above sea level.]

State and project.	Reservoir.	Available capacity in acre-feet.	Elevation.		Storage in acre-feet.			Out-flow in acre-feet.	Elevation of water surface.		
			Spill-way crest. ¹	Lowest gate sill. ²	Begin-ning of month.	End of month.	Maxi-mum.		Begin-ning of month.	End of month.	Maxi-mum.
Arizona, Salt River.....	Roosevelt ³	1,305,000	2128	1903	762,950	676,928	762,950	-----	184.05	177.01	184.05
California, Orland.....	East Park.....	51,000	1199.68	1111.68	51,160	51,000	51,160	852	1199.78	1199.68	1199.78
Idaho:											
Boise.....	Arrowrock.....	280,000	3211	2956	248,080	280,000	283,000	735,070	3201.1	3212.2	3213.2
	Deer Flat.....	177,000	2518	2488	173,734	177,000	177,000	38,202	2517.65	2518.0	2518.0
Minidoka.....	Lake Wolecott.....	95,180	4245	4236	90,990	103,260	103,860	1,217,136	4244.64	4245.67	4245.72
	Jackson Lake.....	847,000	6769	6730	359,350	642,390	642,390	-----	6748.48	6760.75	6760.75
Montana:											
Milk River.....	Nelson.....	27,000	2214	2200	28,200	26,900	28,200	250	2212.89	2212.44	2212.89
St. Mary Storage.....	Sherburne.....	33,000	4788	4720	-----	-----	-----	-----	-----	-----	-----
Sun River.....	Willow Creek.....	16,700	4130	4085	14,120	16,222	16,222	-----	4127.3	4129.5	4129.5
Nebraska-Wyoming, North Platte.....	Pathfinder.....	1,070,000	5852	5670	843,130	1,085,380	1,085,380	136,950	5840.93	5852.68	5852.68
	Lake Alcee.....	11,400	4182	4159	8,697	11,074	11,074	-----	4173.3	4181.6	4181.6
	Lake Minatare.....	60,700	4125	4074	50,389	62,506	62,506	-----	4120.0	4125.8	4125.8
Nevada, Newlands.....	Lake Tahoe.....	120,000	6230	6224	-----	-----	-----	-----	6225.35	6226.09	6226.09
	Lahontan.....	290,000	4162	4060	169,240	216,700	216,700	38,130	4149.10	4155.80	4155.80
New Mexico:											
Carlsbad.....	McMillan.....	45,000	3267.7	3241.6	15,000	-----	-----	-----	3261.1	-----	-----
Rio Grande.....	Elephant Butte.....	2,638,800	4407	4231.5	1,639,369	1,691,096	1,691,096	110,800	4378.10	4379.09	4379.90
Oregon, Umatilla.....	Cold Spring.....	50,000	621.5	560	47,100	48,850	48,850	9,971	639.58	620.74	620.74
Oregon-California, Klamath.....	Clear Lake.....	462,000	4540	4514	416,000	405,000	416,000	2,600	4538.2	4537.86	4538.2
South Dakota, Belle Fourche.....	Belle Fourche.....	203,000	2975	2920	188,250	175,380	188,250	16,131	2973.0	2971.3	2973.0
Utah, Strawberry Valley.....	Strawberry.....	250,000	7559	7517	219,040	253,600	253,600	-----	7553.7	7558.5	7558.5
Washington:											
Okanogan.....	Conconully.....	14,400	2290	2232	5,469	11,227	11,227	2,780	2261	2283	2283
Yakima.....	Bumping Lake.....	34,000	3426	3389	5,270	31,335	31,335	-----	3397.1	3424.1	3424.15
	Lake Cle Elum.....	22,890	2134	2122	26,890	30,165	31,850	1,685	2135.2	2136.6	2137.3
	Lake Kachess.....	210,000	2253	2192	191,245	210,510	216,840	6,330	2251.1	2255.6	2257.05
	Lake Keechelus.....	152,000	2515	2425	111,960	136,310	136,310	-----	2497.6	2508.3	2508.35
Wyoming, Shoshone.....	Shoshone.....	456,600	5360	5132.3	200,456	355,360	355,360	71,705	5310.5	5343.5	5343.5

¹ Or maximum storage.² Or zero storage.³ Zero water depth at elevation 1902.2.⁴ Amount of silt shown by silt survey deducted from original capacity.⁵ Proposed regulation.⁶ Estimated low-water limit under proposed plan of regulation.⁷ Elevation of reservoir raised 12 inches by stop logs in spillway.⁸ 50-inch flashboards on spillway crest.

SALT RIVER PROJECT, ARIZONA.

Operation and maintenance of irrigation system.—Water was out of the Eastern, Maricopa, Grand, Joint Head, and Salt canals for a short period for cleaning purposes.

Five regular maintenance crews were in the field and the following statement shows the average number of men and stock employed and the results accomplished: Average number of men, 187½; average head of stock, 12; miles main canals cleaned, 76½; miles laterals cleaned, 149½; number of new structures installed, 12; number of old structures repaired, 112; riprap placed, 1,846 linear feet; dry masonry placed, 1½ cubic yards; dirt fill placed, 1,597 cubic yards; concrete placed, 13 cubic yards; miles of new waste ditches, 1½; 24-inch corrugated pipe placed, 260 linear feet; 24-inch concrete pipe placed, 220 linear feet.

The Ruth dredger bermed 13½ miles on the Western and Highline Canals in 24 working days.

Four pump houses for subdrainage in the Chandler District and also the fourth house for subdrainage along the Arizona and Grand Canals and one pump house in the Peoria District were finished during the month.

Operation of power system.—The total power generated during the month was 5,242,690 kilowatt-hours. The Roosevelt plant operated 738.1 hours and generated 3,443,000 kilowatt-hours; the Cross Cut plant operated continuously, generating 1,056,300 kilowatt-hours; the Arizona Falls plant operated 439 hours and generated 106,150 kilowatt-hours; the South Consoli-

dated plant operated 631 hours and the Chandler plant 690 hours.

The substations were all operated without trouble and the pumping plants were all available for service as needed.

Construction work.—At Roosevelt the generator for Unit No. 3 was rewound and installed. The rewinding of the generator from Unit No. 5 was started and completed and it was installed on Unit No. 1 and placed in operation. The generator from Unit No. 1 was on the floor ready for stripping for rewinding.

The canal pump at the power plant was installed and placed in operation.

At the Highline pumping plant, Units Nos. 2 and 3 were changed, the pump shells being bored out, larger impellers installed in pumps and the 250 H. P. motors installed for each unit. This job was completed successfully, no trouble of any kind being experienced with the new and rebuilt equipment.

Drainage pumps northeast of Phoenix.—The construction of the lines and substations were completed and they were placed in service. The installation of the pumps, motors, and wiring in all of these ten plants was completed and all plants were placed in operation.

Drainage pumps west of Chandler.—Work on the installation of the pumps in these plants started on May 28.

Office.—A total of 191,200.90 acres was entitled to irrigation water service on the first of the month.—C. C. Cragin.

YUMA PROJECT, ARIZONA-CALIFORNIA.

Unusually cool weather prevailed during May. Because of the prevailing drought on the ranges a considerable number of cattle were shipped into the valley for pasturing. On the 12th Project Manager Preston attended a conference at El Centro between the Imperial Irrigation District officials, Director Davis and Chief Engineer Weymouth, in regard to the Boulder Canyon Dam.

Construction.—The Bucyrus drag line advanced 0.45 mile along the East Drain, excavating 26,000 cubic yards of earth. Monighan drag line No. 2 advanced 1 mile on the South Drain, excavating 52,000 cubic yards. The P. & H. drag line continued work on the slough at the end of the main drain until the 16th, excavating 1,400 cubic yards of earth, and was then moved to the South Drain to assist the Monighan. Seepage from the high water in the river threatened to destroy crops over a considerable area at the 21 milepost, but by using both machines the drain was dug through the threatened area and it is believed the crops will be saved. On this work the P. & H. machine excavated 950 feet of drain, or 2,500 cubic yards.

Operation and maintenance.—Eleven thousand six hundred acre-feet of water were delivered to users. Ruth Dredger No. 6, on the Indian Reservation, cleaned 4.75 miles of laterals, excavating 7,000 cubic yards of silt; in the Yuma Valley three Ruth dredges cleaned 17.75 miles of laterals, excavating 24,000 cubic yards of silt; 28,000 cubic yards of rock riprap were placed on the levees.

The maximum discharge of the Colorado River was 68,000 second-feet; minimum, 17,500 second-feet. On May 31 the gage height was 23.9, with a discharge of 61,000 second-feet. The total discharge for the month was 2,670,000 acre-feet.

Official visitors included Messrs. Briggs and Kohn, of Fairbanks, Morse and Company, Director Davis and Chief Engineer Weymouth.—*Porter J. Preston.*

MESA DIVISION, PART 1.

May weather conditions were favorable for construction work. The rock-crushing plant at the Mesa quarry was operated continuously but with a smaller crew; the rock crushed and screened was placed on the Mesa roads and used for concrete at the B Lift pumping plant. One-half mile of road was completed during the month. The road is now complete to the center of the United States town site in Section 17.

Construction of the B Lift pumping plant was carried on with a force of about 15 men, and at the end of the month the form work and the placing of the reinforcing steel and conduit system in the motor floor were in progress. Circular forms for 72-inch concrete force main were made. The construction plant for the manufacture of lock-joint pipe was being erected.

The 30-B Bucyrus drag line worked between Stations 220 and 260 on the East Main Canal, moving 30,000 cubic yards of excavation. Monighan dredge No. 1 worked on the East Main Canal until the 11th.

Labor was not so plentiful as during the previous month.—*Porter J. Preston.*

ORLAND PROJECT, CALIFORNIA.

There was an unusual number of cool, cloudy days during May. Some damage was done to fruit by a hailstorm on the 27th. About one-third of the second crop of alfalfa was cut, and most of the barley har-

vested and in the shock. A large acreage of milo and other grain sorghums was planted. Seven thousand five hundred acre-feet of water were delivered and 11,700 acres irrigated. The flow of Stony Creek at the Simpson's bridge gage was 22,400 acre-feet; for May, 1920, it was 2,300 acre-feet. The natural flow of Stony Creek will probably furnish sufficient water for project needs well into June.

The directors of the water-users' association at their regular meeting requested the preparation of a preliminary estimate for additional storage.

Applications for loans were received and appraisals made for the first allotment of funds from the Federal Land Bank at Berkeley.

Maintenance work consisted of surfacing operating roads and mowing weeds along canals and laterals.—*A. N. Burch.*

GRAND VALLEY PROJECT, COLORADO.

May weather was favorable for outside work of all kinds as well as for farming operations. Labor was available in excess of the needs of the project.

All crops made a satisfactory growth during the month, though alfalfa was held back somewhat on account of cool weather. An excellent stand of sugar beets was secured and thinning was in progress. Winter wheat was heading out and spring grains were coming on rapidly. Prospects for a satisfactory fruit crop in the valley were excellent, and the yield of all varieties will be up to normal. Alfalfa hay was selling for \$9 per ton and nearly all of last year's crop had been disposed of.

The irrigation system was operated without interruption during the month, supplying water to 20,000 acres of land in the project and the two irrigation districts. Diversions were increased to 430 second-feet and approximately 10,000 acre-feet of water were delivered during the month. The principal maintenance work undertaken consisted of incasing with concrete a 24-inch vitrified pipe siphon on lateral 1, repair of one main canal turnout, removal of weeds from laterals, and repair of wooden structures. Two lateral extensions 2,600 feet in length were constructed and 21 minor structures were installed on the lateral system.

Drainage construction was prosecuted with three drag-line excavators working on project drains and one drag line on the cooperative work in the Grand Valley Drainage District. Two miles of drain were completed, involving 50,000 cubic yards of excavation.—*S. O. Harper.*

UNCOMPAHGRE PROJECT, COLORADO.

May weather conditions were somewhat below normal, and, as a result, growing crops were retarded until the end of the month, when the crop situation was about normal, both in stand and growth.

The heavy demand for irrigation water and the low stage of the Uncompahgre River necessitated carrying the Gunnison Tunnel at 80 to 90 per cent of full head during the greater part of the month.

The P. & H. drag line completed the enlargement excavation of the Boomer Feeder to the West Canal, and also back filled two drops.

The construction of the G. H. D. C. lateral of the East Canal system was completed. Minor structures, such as drops and measuring devices, were installed on the lateral systems as required.

All the project canals and laterals were carried at maximum capacity. No operation difficulties were experienced, and very little maintenance work was

required, except the usual riprapping and weed cleaning of the laterals and gravel sluicing at the head gates of the main canals.—*L. J. Foster.*

BOISE PROJECT, IDAHO.

May weather was favorable to crops and range. Heavy rains occurred from the 16th to 20th, which brought the precipitation for the month above normal.

Labor conditions.—No change occurred in labor conditions over the past few months. A large number of men and teams were unemployed, with little prospect of better conditions in the near future.

Farming operations.—The farmers were busy planting corn and late potatoes, and in irrigating grain and alfalfa. Owing to the favorable weather, the crops were in excellent condition, with the exception of peaches and apricots, which were killed by a late frost.

Water supply.—The run-off from the Boise River drainage area was the heaviest recorded for the month. On the 17th the discharge amounted to about 20,000 second-feet. After that time it fluctuated, but was still at flood stage at the end of the month. Reports from the higher drainage area indicated that there was still a large amount of snow, which was well packed.

Operation and maintenance.—The entire canal system was in operation. Owing to rains after the middle of the month the demand for water was not heavy. A number of turnouts and weirs were replaced and minor repairs were made to structures and canal banks. Under the Notus Division a small crew was engaged in priming and puddling the canals, as well as delivering water to those whose land was in shape for irrigation.

Construction.—On the Notus Canal division one small crew was engaged in the construction of tap boxes, turnouts, and canal drops.

Drainage.—The one-yard dragline excavator continued work in the Fargo basin. The field party engaged on drainage surveys continued work throughout the month.

Surveys.—Survey work was in progress in connection with the drainage, construction, and operation and maintenance work under way, and consisted principally in giving lines, grades, and locations of farm laterals.

Visitors.—Messrs. Maurice De Gove, Eugene Touche, and Paul Feully, French engineers, visited the project on May 14. A. H. Gullickson, chief accountant, visited the project on May 31.—*J. B. Bond.*

KING HILL PROJECT, IDAHO.

May weather was favorable for construction work, though precipitation for the last fifteen days was much above normal.

Operation and maintenance.—On May 18 the United States took over the operation of the project under a temporary contract with the King Hill Irrigation District. Water was turned out of the canal on the 25th to permit repairs to wooden structures. All water users had ample water and at the end of the month the project was well irrigated. A maintenance crew of four to five men was busy repairing turnout, riprapping banks, making minor repairs to siphons, and repairing drains.

Construction.—A small force was employed at King Hill making forms for Cold Springs flume and repairing equipment preparatory to the construction season.

Field and office engineering.—One field party was engaged on location of Cold Springs flume. Office en-

gineering consisted of preparation of bills of material, in addition to the routing work.

The cement shed was moved from Camp 5 to Cold Springs flume, and at the end of the month two trucks were hauling cement to the new location.

The labor situation was satisfactory.—*Walter Ward.*

MINIDOKA PROJECT, IDAHO.

May was characterized by unusually heavy rainfall, the total precipitation being 3.04 inches. This is the highest record for any May since 1908.

On account of the rainy weather the demand for irrigation water was very light. The total amount of water pumped on the South Side pumping division was 22,055 acre-feet. Of this amount, about 8,500 acre-feet were delivered to farm units. In 1920, 36,008 acre-feet were pumped and 20,402 acre-feet delivered to farm units.

The maximum discharge at the First Lift Pumping Station was reached on the 17th, when 641 second-feet were pumped, but this amount had decreased to 266 second-feet at the end of the month.

Regular maintenance work was carried on, including considerable repairs and replacements of small timber structures and some riprapping of main canal banks.

The construction of the transmission line from Burley to Milner was practically completed. The foundation of the Miller substation was poured and the steel tower erected. This is the 2,000-kilowatt substation which will be used for transforming from 30,000 to 44,000 volts for connection with the Idaho Power Co. The addition to the building for the Burley substation was finished and ready for the machinery.

At the Minidoka power house the load increased until the 17th, when the full capacity of the station was reached. After that date, however, the demand fell off until, at the end of the month, only three generators were in operation. The total output of power during the month was 4,060,900 kilowatt-hours, whereas a year ago it was 5,498,370. The reduction in output was due to the decreased demand at the pumping stations.

Tests were made of the capacity of the Boise River power plant. The work of repairing its equipment was continued by the Idaho Power Co.

At American Falls two engineering parties were engaged for a few days in making topographic surveys. They covered 2,415 acres, making the total area surveyed to the end of the month 85,707 acres. Another party ran 14 miles of levels, completing the feature of level control for the reservoir. At the end of the month 84 miles of primary and 297 miles of secondary levels had been run. A number of test wells were located for making a study of ground-water conditions near the reservoir.

A system of coordinates was established in connection with the new townsite of American Falls, for use in laying it out. Cleaning of brush from the town site was nearly completed.

Appraisal of buildings in the old town site was completed. One appraiser of country property during the month appraised 95 farms, having an area of 10,510 acres. The total number of farms appraised to the end of the month was 149, with an area of 20,909 acres.

No right of way was purchased during the month, but five contracts were approved, amounting to \$4,315.

Three parties were engaged part of the month in a topographic survey of the North Side Minidoka pumping division. They covered 6,910 acres, making a total area of 138,348 acres surveyed on this division.

Shipments of farm products amounted to 203 cars. Of this number there were 76 cars of hay, 4 of wheat, 31 of flour, 37 of potatoes, 18 of cattle, 35 of sheep, and 2 miscellaneous.

Crop conditions on the project were good, although the rainy weather interfered with farm work a good deal. Snake River continued to rise during the month, its discharge increasing from 9,232 second-feet on the 1st to 29,496 second-feet on the 31st.—*Barry Dibble.*

HUNTLEY PROJECT, MONTANA.

May weather conditions were in marked contrast to those prevailing during the past 10 months. Heavy rains were frequent, and no irrigation was required. A heavy wind and hailstorm on the 31st damaged crops materially on the west end of the project.

The operation and maintenance work was well completed and the organization reduced to a low stage. The Austin drag line was employed in cleaning the Main Canal between stations 228+00 and 241+75. The material was heavy silt and wet excavation. A great deal of trouble was experienced with the main clutch on this machine, and considerable time lost for repairs. A Ruth dredger arrived on the 28th and was unloaded and partly assembled.

The general agricultural conditions were the best in a number of years. Early seeding was possible and this, with the late rains, produced the best growing season for three or four years.

Beets were being cultivated and thinned. Alfalfa was well advanced and grains were making exceptional growths.—*A. R. McGinness.*

MILK RIVER PROJECT, MONTANA.

May weather conditions were favorable for construction and farming operations. The precipitation of 2.66 inches was 0.67 inch above normal and the greatest for any May since 1916. The temperature was about normal, although the weather seemed cold and windy for a large part of the month. The range was in excellent condition and stock in good shape. All crops were in good condition and the alfalfa crop looked especially good. The labor supply was plentiful.

Surveys.—Farm unit and lateral extension surveys were continued with increased force. Additional test wells were put down and other drainage investigations were continued.

Construction by contract.—Six small earthwork contractors in the vicinity of Paisley and Hinsdale continued or commenced work and made fair progress. One small structure contractor continued work, making good progress. Contract for the enlargement of Nelson Reservoir was awarded to White, Brown & Leahy Co., of Great Falls, Mont., but work had not commenced at the end of the month. Contract for lateral extensions, comprising about 33,000 yards of earthwork near Paisley, was awarded to Hall & Booth, but work was not begun under this contract.

Construction by Government forces.—Eighteen miles of operation and maintenance roads were completed. Work was resumed on building the concrete siphon, carrying the NS-110-2-10 across Beaver Creek, about 5 miles west of Hinsdale. A large number of small structures, mostly wooden turnouts, measuring devices, and checks, were placed. About 75 M feet b. m. of lumber were given a preservative treatment.

Crop report, Huntley project, Montana, 1920.

Crop.	Area (acres). ¹	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	7,468	Ton.....	16,962	2.27	\$7.90	\$134,000	\$17.94
Alfalfa seed.....	12	Bushel.....	4	0.33	24.00	96	8.00
Barley.....	324	do.....	4,816	14.82	.89	4,286	13.23
Beets.....	2,330	Ton.....	14,814	6.36	12.00	177,769	76.29
Clover hay.....	54	do.....	99	1.83	10.75	1,064	19.70
Clover seed.....	142	Bushel.....	305	2.15	7.30	2,227	15.69
Corn.....	392	do.....	4,441	11.33	.81	3,597	9.18
Garden.....	180					16,667	92.08
Oats.....	1,764	Bushel.....	40,960	23.22	.67	27,443	15.55
Pasture, summer.....	2,074					18,136	8.74
Winter pasture ²	15,550					28,301	1.82
Potatoes.....	78	Bushel.....	6,449	82.68	1.11	7,158	91.77
Wheat.....	5,098	do.....	83,549	16.38	1.44	120,040	23.54
Miscellaneous.....	104					2,996	28.80
Less duplicated areas.....	15,550						
Total cropped.....	20,020	Total and average.....				543,780	27.10
		Areas.....	Acres.		Farms.	Per cent of project.	
		Total irrigable area farms reported.....	27,468		601	0.83	
		Total irrigated area farms reported:					
		Under water-right applications.....	19,585		584	.59	
		Under rental contracts.....	436		17	.013	
Total irrigated.....	20,020	Total cropped area farms reported.....	20,021		601	.61	

¹ Includes 526 acres without crop value: Beets 53, oats 84, alfalfa 35, corn 64, barley 38, wheat 252.

² Winter pasture derived from beets, wheat, oats, and alfalfa.

Operation and maintenance.—Cleaning the Dodson North Canal by dragline was continued one shift per day during the fore part of the month, and two shifts per day in the latter part; 1.3 miles were cleaned. Cleaning laterals by team methods was in progress on the Glasgow Division and on the Malta division near Dodson, about three miles being cleaned. Some work was done on river bank protection at Vandalia Point and on the protection of canal banks and wasteways at other points. The usual operation and maintenance work in connection with the delivery of water was in progress, but on account of the comparatively large rainfall little water was delivered; however, the canals were operated intermittently. Ninety water-rental applications were received during the month and 136 to date. Thirty-seven water deliveries, amounting to 500 acre-feet, were made. The water supply in the Milk River was ample and no supplemental water from the St. Mary storage was used.—*Geo. E. Stratton.*

ST. MARY STORAGE DIVISION.

Several rainstorms occurred during May, but only an average amount of windy and severe weather. Owing to rains in the mountains, combined with warm weather, the flow in St. Mary River and its tributaries was considerably above normal a part of the month.

The St. Mary Canal was put in operation on the 9th and operated the remainder of the month. A total of 8,398 acre-feet was diverted from the St. Mary River, and 6,590 acre-feet were delivered to the North Fork of the Milk River.

A small crew, consisting of 12 men and 6 teams, was employed repairing canal banks between the diversion and the St. Mary crossing during the entire month. A class 30-B Bucyrus drag line was moved 7 miles across country and put to work removing slides from the St. Mary Canal. At Sherburne Lakes Dam a small crew was employed laying pavement on the face of the dam from the 10th to the end of the month, and a small crew was organized the last five days of the month to straighten up the concrete retaining wall in the lower end of the spillway channel that failed, owing to the movement of the North Hillside Slide. No water was stored in Sherburne Lakes Reservoir.—*R. M. Snell.*

SUN RIVER PROJECT, MONTANA.

May weather was generally cool and clear. A rainy spell occurred between the 5th and 9th, during which about 1.5 inches of precipitation was recorded. A light storm occurred on the 26th.

The construction of lateral H, station 283 to station 303, and lateral H30, station 0 to station 52, under informal contract with David Svenby, and construction of lateral D23, station 24 to station 53, Greenfields division, under informal contract with Henry and John Bremer, was completed.

Water was turned into the Fort Shaw Canal on the 13th, and during the remainder of the month from 35 to 78 second feet were carried for irrigation in the Fort Shaw division. Twenty-one deliveries were made. On the 20th a small head of water was turned into the Sun River Slope Canal and irrigation was begun on the Greenfields Bench on the 23d. A break in the concrete lining opposite Camp 16 occurred on the 24th and water was diverted through the Elbow Coulee Wasteway and the break repaired. Irrigation was resumed on the 30th. Sixty contracts for delivery of

water to farm units in Greenfields division were signed at the Fairfield office.

Seven maintenance crews were employed during favorable weather. On Fort Shaw division, laterals C, D, and K were cleaned and 6 worn-out wooden structures were replaced with concrete structures. On Greenfields division heavy deposits of wind-blown silt were removed from the laterals, a break in the concrete lining of Greenfields Main Canal was repaired, gravel was placed in the voids of the rock paving of Pishkun Reservoir Dike No. 4, and leaky structures of Pishkun Reservoir Supply Canal below tunnel No. 2 were repaired. Telephone lines Nos. 2 and 3 were repaired.

Farm work consisted of plowing, leveling, seeding, irrigating, etc. Crops generally were in very good condition. The acreage seeded was rather small, but the ground for all crops was well plowed and an excellent seed bed prepared. Cutworms damaged grain to some extent on Greenfields division but none were found on Fort Shaw division. Carload shipments from the project consisted of 8 cars of wheat, 3 of potatoes, and 7 of hay.—*Geo. O. Sanford.*

LOWER YELLOWSTONE PROJECT, MONTANA-NORTH DAKOTA.

May weather was cool and ideal for maintenance work. Heavy winds were frequent.

Satisfactory progress was made in farming operations and at the end of the month nearly all seeding was completed.

Heavy frost on the 15th did considerable damage to sugar beets, and a few fields were reseeded. Alfalfa was about two weeks ahead of normal conditions and indications were that the first cutting will be ready by the 20th of June.

A summary of the work done under operation and maintenance was as follows: Farm turnouts installed, 18; miles of laterals cleaned, 5; concrete checks installed, 19; wooden bridges raised and repaired, 2; concrete drops constructed, 8; main canal pipe turnouts, 3; wooden culverts repaired, 6; miscellaneous structures repaired or replaced, 18.

Drag-line machine No. 1 cleaned 3,600 linear feet of main canal and removed the material at Arkle Slide. Machine No. 3 completed the cleaning of silt in the vicinity of First Hay Creek, and cleaned 10,630 linear feet of drain No. 1. Both of these machines completed the work planned for them this season.—*L. H. Mitchell.*

NORTH PLATTE PROJECT, NEBRASKA-WYOMING.

May weather was generally cloudy and rainy, with several heavy storms, which did considerable damage in some localities. The rains helped the crops, but interfered with the progress of construction work.

Operation.—The outflow from the Pathfinder Reservoir was maintained practically at a uniform average of 2,227 second-feet. The inflow increased from 1,480 to 12,160 second-feet. The reservoir was filled and water started flowing over the spillway on the 30th. All valves were then closed to facilitate work on the new outlets.

The diversion into the Interstate Canal increased to 1,150 second-feet through the middle of the month and then decreased to 800 during the last part of the month. The heavy rains reduced the demand for water and the storage reservoirs were all full.

Deliveries from the Fort Laramie Canal for irrigation purposes were begun on the 6th, but there was little demand.

The maintenance work on both divisions was confined to routine maintenance and replacement work. On the Interstate Division drag line No. 122,230 continued work on the Interstate Canal banks, moving 16,412 cubic yards of material, or 469 cubic yards per shift.

Crops.—Some of the old crops were still left on the project, about 17 per cent of the alfalfa, 20 per cent of the wheat, 7 per cent of the oats, and 5 per cent of the potatoes. The frequent rains put the ground in excellent condition, and although the weather was cool the new crops were doing well. The crop census was completed, showing 87,616 acres in crop on the Interstate division and 11,417 on the Fort Laramie division.

Drainage.—Drag line No. 122,221 began excavating on the lower end of the new Minatare drain, operating with three shifts daily until the 13th, when it was moved to clean the McGrew drain, which work was completed on the 24th. The machine broke down on the way back to the Minatare drain and was replaced by drag line No. 122,229. The total excavation was 13,016 cubic yards, or an average of 266 cubic yards per shift.

Drag line No. 121,157 continued work on the Dutch Flats outlet drain, operating with three shifts daily and excavating 16,449 cubic yards of Class 1 material, or 298 cubic yards per shift. The pumps and motors for Drainage Wells Nos. 2 and 3 arrived, and the work of installing was begun.

The closed drains in the Winters Creek and Sheep Creek areas were completed, 5,348 linear feet of 12-inch tile being laid. The back filling on the Winters Creek area was completed and that on the Sheep Creek area will be done by contract.

On the Fort Laramie division electric drag line No. 131,313 continued work on the Cherry Creek drain on Branch "D." The machine was operated two shifts daily, and excavated 39,733 cubic yards of Class 1 material, or 744 cubic yards per shift. The permanent structure for the crossing of the Rock Ranch Canal under this drain was completed.

Construction.—Storage division: Work was continued on the construction of the new North Tunnel outlets at the Pathfinder Dam, one shift being worked daily to the 20th and a second shift added at that time. The total excavation for the month from the tunnel and valve-house cave was 540 cubic yards. Twenty-five feet of concrete lining in the tunnel were completed, the yardage for the month being 131 cubic yards. During the latter part of the month a crew was employed moving material and equipment away from the spillway in anticipation of the overflow, which started on the 30th.

Fort Laramie division: After completing the Whalen service bridge, the bridge crew constructed a bridge over the Fort Laramie Canal, near the head works, and then started on the Laramie River service bridge.

Three of the electric drag lines were at work on the Fort Laramie Canal in Wyoming, each being operated two shifts daily. The total yardage moved during the month was 94,875 cubic yards, completing 1.38 miles of canal.

Dragline No. 121,150 was used near the Lingle power plant to load brule clay into wagons to be used in road construction on the banks of the Fort Laramie Canal.

The powder crew drilled 2,740 linear feet of holes, and used 4,100 pounds of T. N. T. in blasting classified material on the Fort Laramie Canal.

Good progress was made on the construction of canal and lateral structures by Government forces.

Work was begun on the structures in the Upper Cherry Creek Valley. A large number of contracts were let for earthwork, gravel hauling, and construction of structures. The work was let in small quantities, in order that local men and farmers might secure work, and the prices bid were generally low.

Northport division: The excavation of the Northport Canal was continued by the electric dragline, the Bucyrus Class 14 dragline, and the elevating grader outfit constructing fills ahead of the dragline. The structure forces made good progress on the construction of canal and lateral structures. Several earthwork, one gravel hauling, and one structure contracts were in force and preparations were being made to advertise more work.

Power system.—The Lingle power plant was operated continuously, with three shifts daily. In addition to the power used for construction purposes, 2,450 kilowatt-hours were delivered to Lingle, Wyo., 28,200 kilowatt-hours to Torrington, Wyo., 8,200 to Morrill, Nebr., and 31,000 to Mitchell, Nebr.

Surveys.—The field parties were all busy on lines and grades for construction work, both by Government forces and contract, and the preparation of new work for advertisement.—H. C. Stetson.

Prevailing crop prices at close of May, 1921.

Project.	Alfalfa hay, per ton.		Barley, per bushel.	Oats, per bushel.	Wheat, per bushel.	Potatoes, per bushel.
	In stack.	Baled at shipping point.				
Salt River.....	\$6-8	\$10-12	\$0.57		\$1.20	\$2.10
Yuma.....	9.00	11.00				
Orland.....	7.00	10.00	.50		1.35	
Grand Valley.....	9.00	13.00		\$0.70	1.80	.75
Uncompahgre.....	5-10		1-1.25	.40-.50	1-1.10	.70
Boise.....	5.00	9.00	.45	.50	1.10	1.10
King Hill.....	8.00	10.00		.43		
Minidoka.....	7.00	12.00	.75	.75	.95	.50
Huntley.....						
Milk River.....	8.00	11.00	.25	.56	1.15	1.50
Sun River.....	7.00	10.00	.65	.70	1.24	.45
Lower Yellowstone.....	10.00		.50	.60	1.36	.60
North Platte.....	5.00		.50	.30	1.20	.50
Newlands.....	8.00	12.00				1.20
Carlsbad.....						
Rio Grande.....		16.00				
North Dakota pump-ing.....	15.00	19.00		.23	1.35	1.00
Umatilla.....	8.50					
Klamath.....	12.00	20.00	.60	.40	1.20	1.05
Belle Fourche.....	5.00	9.00	1.00	.40	1.20	1.20
Strawberry Valley.....		16.00	.65	.67	.66	6.00
Okanogan.....	20.00	24.00				1.00
Yakima:						
Sunnyside unit.....	8.50-9	12.50-13				.72
Tieton unit.....	8.50-9	12.50-13				.72
Riverton.....						
Shoshone.....				.40	1.00	.60
Indian projects:						
Blackfeet.....	10.00		.24	.18	1.29	
Flathead.....	10.00	15.00			1.07	
Fort Peck.....				.21	1.31	1.20

NEWLANDS PROJECT, NEVADA.

Unprecedented rainfall occurred during May, which helped materially in the accumulation and conservation of storage water in Lahontan Reservoir besides doing immense good to crops and range.

Crops.—All crops made a phenomenal growth as a result of the favorable weather conditions which followed the hitherto cold, backward spring. Sugar beets

sprouted well and were generally well advanced toward the thinning stage. Cantaloupes, of which there were about 300 acres planted, were protected from the late frosts by special coverings and, as a result, were in a most promising growing condition at the end of the month. Grain and alfalfa were well advanced, especially winter wheat, of which there was quite an acreage planted this year, and which, with alfalfa, will be ready for harvesting about the middle of June.

Water supply.—The Lahontan Reservoir rose 6.70 feet during May, which was equivalent to a gain of 47,460 acre-feet storage. The storage in this reservoir at the end of the month of 216,700 acre-feet was about 20,000 acre-feet in excess of that on the same date in 1920, and it is expected that this additional storage, combined with the more favorable weather conditions this year, will permit operating the Lahontan power plant through the auxiliary take out from the reservoir throughout the period of low water in Truckee River, upon which stream the plant is ordinarily dependent.

Operation and maintenance.—The operation of the canal system was uninterrupted, except for a few minor breaks in the lateral system. Owing to the abundance of rainfall the use of water was considerably below normal for May, the total diversion being about the same as for April. The Truckee Canal was operated at its maximum safe capacity of about 600 second-feet for irrigation, power, and storage purposes.

About 7 miles of laterals in the Soda Lake district were cleaned, which had become badly filled in with sand as a result of the spring winds; one-half mile of the C2 drain was cleaned by means of the small Austin dragline excavator. The cost of this work was partly defrayed by Churchill County, owing to its benefit to county roads in the vicinity.

Considerable brush riprap work was done on portions of the S canal bank and below the Ke check in Truckee Canal.

Fifteen minor canal and lateral structures were repaired in addition to two large turnouts in Truckee Canal. One spillway box was installed in the L canal where a private drain empties.

Construction.—Bids were opened on May 2 for the excavation of the J lateral extension from station 33+00 to station 40+00, involving 1,080 cubic yards of earthwork, and the Pierson waste-water ditch, station 7+00 to station 45+00, involving about 1,522 cubic yards of earthwork. Both of these jobs were let in the Carson Lake district, and the contracts were let at 14 and 10 cents per cubic yard, respectively.

Nine farm take outs were installed in the lateral system, together with 2 checks, 5 drops, 3 culverts, and a small flume 40 feet long over the Qb lateral. A small amount of excavation work was done on Carson Lake pasture drains in the way of extension. A powder cellar was also constructed at the project yards. All the above work, with the exception of the two contracts, was performed by the regular maintenance force and charged to construction.

Settlement.—During May two homesteads were filed on, embracing 108 acres, and water rights taken out on four tracts of private land, embracing 247 acres. Lands on the plats open to entry included 16 homesteads, totaling 1,067 acres, and 6 tracts of private land, embracing 672 acres, for which water rights are available. Numerous inquiries for land were received during the month.

Carson Lake pasture.—At the end of the month 1,100 head of stock, consisting of 776 head of cattle and 324 head of horses and mules, were being grazed

in the pasture. Feed was abundant and stock were reported in excellent condition.

Miscellaneous.—On May 2 the board of directors of Truckee-Carson Irrigation District held a meeting, at which a resolution was passed indorsing the construction of the proposed Spanish Springs Reservoir.

Division Engineers A. E. Stewart and O. M. Weeks, of the Southern Pacific Railroad maintenance of way department, conferred with the project manager on May 13 relative to protection work along the Southern Pacific Co.'s Goldfield and Tonopah branch line, the grade of which is subject to damage from wave action in event of extreme high water in Lahontan Reservoir.

A committee from the Walker River Irrigation District spent two days on the project in the latter part of the month studying the proposed drainage scheme for this project, preparatory to organizing a drainage district in Walker River Valley.—*Theo. H. Osmundson.*

Project weather during May, 1921.

Project.	Station.	Temperature, °F.			Precipitation (inches).
		Maxim.	Minim.	Mean.	
Salt River.....	Phoenix, Ariz.....	101	48	73.6	0.17
Yuma.....	Yuma, Ariz.....	103	47	73	.06
Orland.....	Orland, Calif.....	95	39	63.3	1.53
Grand Valley.....	Grand Junction, Colo.....	89	38	61.6	1.12
Uncompahgre.....	Montrose, Colo.....	87	31	58	1.03
Boise.....	Boise, Idaho.....	81	35	57.2	2.15
King Hill.....	Glenns Ferry, Idaho.....	77	36	59	3.18
Minidoka.....	Burley, Idaho.....	78	30	52.2	3.04
Huntley.....	Ballantine, Mont.....	81	32	51.7	2.80
Milk River.....	Malta, Mont.....	81	34	55.2	2.66
St. Mary storage.....	Near Babb, Mont.....	77	15	47	2.66
Sun River.....	Fort Shaw, Mont.....	80	20	51.6	1.84
Lower Yellowstone.....	Savage, Mont.....	85	27	55	0.77
North Platte.....	Wyncoote, Wyo.....	84	25	53.1	1.69
Newlands.....	Fallon, Nev.....	89	27	57	1.64
Carlsbad.....	Carlsbad, N. Mex.....	.....	.....	.....	.....
Rio Grande.....	El Paso, Tex.....	93	48	71.9	0.31
North Dakota pumping.....	Williston, N. Dak.....	82	26	54	2.08
Umatilla.....	Hermiston, Oreg.....	89	33	59.7	0.41
Klamath.....	Klamath Falls, Oreg.....	82	31	53.9	1.22
Belle Fourche.....	Orman, S. Dak.....	84	28	55	1.47
Strawberry Valley.....	Provo, Utah.....	82	32	55.5	4.40
Okanogan.....	Omak, Wash.....	92	33	60.8	0.32
Yakima.....	.....	.....	.....	.....	.....
Sunnyside.....	Sunnyside, Wash.....	92	31	60.25	0.73
Tieton.....	Cowiche, Wash.....	84	32	55.6	0.89
Riverton.....	Diversion Dam, Wyo.....	77	23	52.6	2.93
Shoshone.....	Powell, Wyo.....	82	23	53.0	2.10
Indian projects:	.....	.....	.....	.....	.....
Blackfoot.....	Browning, Mont.....	72	19	43.9	1.49
Flathead.....	St. Ignatius, Mont.....	81	29	55	0.91
Fort Peck.....	Poplar, Mont.....	84	25	53.3	1.26

RIO GRANDE PROJECT, NEW MEXICO-TEXAS.

May weather was 0.2 degree below normal, with a moderate wind movement and no frosts. There was a rainfall of 0.31 inch, which did not seriously affect cut alfalfa.

The inflow into the reservoir at San Marcial was 191,451 acre-feet, as compared with the inflow of May, 1920, a month of heavy flood, of 677,044 acre-feet, and with the mean May inflow of 296,567 acre-feet. Predictions that the inflow for 1921 would be considerably below normal were being substantiated. Between two and three years' supply was on hand.

At Elephant Butte fruit trees donated by water users were doing well.

The demand for water was heavy, and 32,780 acre-feet were supplied to 61,292 acres, few cuts being

necessary. Approximately 88,770 acres, including idle lands assessed for stored water, were under contract. Sand sluicing was being carried on with increasingly good results. Measurement of individual water deliveries, with a resulting lessening of dissatisfaction, was increasing as more meters were being put in the hands of ditch riders, and the submerged-orifice method was being put into effect.

Maintenance work consisted of raising and brush-mat riprapping dangerous canal banks, repairs to broken banks, checks, tap boxes, and installation of new tap boxes. In the El Paso Valley no maintenance crew was kept in the field, most of the work being done by ditch riders. In the Mesilla Valley 15.3 miles of drain were cleaned, at a cost of \$33 per mile.

Crops retarded by frost were being brought out by the warm weather. Some wheat, injured by frost, was replanted to corn. A moderate fruit crop seemed assured. Alfalfa was stunted by the frost and was being cut. Alfalfa growers' associations and other crop-pooling organizations were being formed under the direction of the county farm bureaus.

About 150 farmers were in attendance on the Fifth Annual Farm Bureau Day of Dona Ana County, N. Mex. Perhaps the most important transaction was the increase in the membership fee from \$5 to \$10, which entitled a farmer to life membership. By resolution, the bureau instructed its executive committee to make effort for the establishment of farm-loan associations in Dona Ana County and to secure a law to permit standardization of cooperative marketing associations.

The reduction in allotment for fiscal year 1921 eliminated prospects for increasing construction activities, or even the possibility of continuing at the rate followed during the past year, and, under these circumstances, together with the diminishing funds for the present year, construction forces were being considerably reduced. This is making available for transfer, if needed, a number of experienced engineers and construction men. All excavators, except those doing the most urgent work, were reduced to one-shift operation, and these will be reduced to one shift also as soon as the urgent work is finished. At Elephant Butte the concrete paving of the embankment was nearing completion, and forces on this work were reduced. The upper portion of the spillway excavation was finished to grade and reinforcing steel was being placed. Concreting plant was practically complete.

In the Rincon Valley the only construction in progress was on the Garfield drain.

In the Mesilla Valley three drag lines continued on drainage construction, all working one shift, excavating 7,440 cubic yards from 1.4 miles of drain and 16,700 cubic yards in 2 miles of lateral.

In the El Paso Valley one Bucyrus excavator, operating three shifts, continued the construction of the Fabens drain, and three machines, operating two shifts, continued on canal and lateral work; 41,190 cubic yards were excavated from 1.1 miles of Fabens drain and 47,695 cubic yards were placed in 2.7 miles of canal banks. The Jennings Construction & Engineering Co. excavated 30,592 cubic yards in 2,800 feet of the Tornillo drain. The I-206 lateral on the Island System and the Parker lateral on the Tornillo System were completed by force account team work—*L. M. Lawson.*

NORTH DAKOTA PUMPING PROJECT.

May weather was favorable for both the farmer and for the project maintenance work.

The Missouri River remained practically stationary until the 20th, after which it rose gradually until a total rise of 6 feet was recorded at Williston. After the ice went out of the river it was apparent that a very decided change had occurred in the channel during the past year. A survey and soundings were made which disclosed such radical changes as to cause the project manager to try to enlist the interest of the War Department in repairs to the revetment and in work to bring the river back into its old channel. The Great Northern Railway also made surveys and proposed to cooperate with the Reclamation Service in any work of rectification. The United States Engineers' snagboat *Mandan* also examined and reported upon the changes, and will make a second trip in June.

Repairs on the pumping barge and pontoon were completed. The barge was launched May 25 with greater success than in any previous year, and behaved better with the pumping units in operation than for several years. Other pumping stations were put in order, and by the end of the month all of the four pumping stations had been in operation under pumping load. June 1 was the date set by the irrigation district for the opening of the irrigation season.

New insulators and pins were placed on the high-tension line, the guys overhauled, and some new ones placed. The switchboard on the barge station was overhauled and lightning arresters installed.

The roofs of boiler room, engine room, and lighting-arrester room at the power plant were repaired.

In the coal mine all narrow work necessary for the irrigation fuel supply was finished, the roof in main haulage way raised, and the grade reduced. The mine was in readiness for a maximum summer demand.

All ditch cleaning, replacing of wooden turn outs, etc., was advanced enough to make the lateral system ready for the operation season.

The power plant was operated for commercial power contract; 75,950 kilowatt-hours of electrical energy were delivered to the city of Williston. This was a decrease of 4,744 kilowatt-hours over the same month of last year.

Seven hundred and sixty-seven tons of coal were mined.—*Wm. S. Arthur.*

UMATILLA PROJECT, OREGON.

May weather conditions were normal.

Farming operations were confined principally to irrigating the first cutting of alfalfa. At the close of the month a few settlers were harvesting the first crop. In some fields the crop was very seriously affected by cheat. Early strawberries and early potatoes were being marketed at the close of the month; 35 cars of baled and chopped alfalfa hay, 1 of hogs, 2 of wool, and over 6 tons of honey were shipped during the month.

Labor conditions were easy for the limited amount of work in progress.

Operation and maintenance.—The feed canal was operated throughout the month, diverting from 115 to 278 second-feet, of which from 26 to 30 second-feet were delivered to the Echo Mills, and from 109 to 230 second-feet to the Cold Springs Reservoir continuously throughout the month. On the 28th the flow in the Umatilla River began dropping rapidly, and the head available for the feed canal was materially affected. From 135 to 188 second-feet were diverted from the Cold Springs Reservoir by Canal A; from 90 to 100 second-feet from the river by the Maxwell

Canal, and from 125 to 154 second-feet by the West Extension Main Canal continuously throughout the month.

General maintenance on the East and West Divisions was carried on intermittently by one small crew on each.

Construction.—On the West Side Division 865 feet of 12, 15, and 16 inch concrete pipe were laid, and four minor structures installed on laterals Nos. 6, 6a, 9a, 19a2, and 30.

On the East Side Division 4 cubic yards of concrete lining, one 20-inch siphon and one weed screen were placed on supplemental construction District No. 33. Pipe was manufactured as follows: 33 feet 4-inch, 1,700 feet 12-inch, 1,207 feet 16-inch, 679 feet 20-inch, and 18 turnouts.—*Maurice D. Scroggs.*

KLAMATH PROJECT, OREGON-CALIFORNIA.

May weather was cool but generally favorable for the growing of crops.

Water deliveries were begun on the 7th, and about 6,500 acre-feet of water were delivered during the month. Due to the cool weather and precipitation, the demand for water for irrigation was unusually light. Practically all spring plowing and the seeding of grain were completed.

One survey party was engaged in field work in connection with the precast flume job on the C Canal. One survey party was engaged in making the final location of the J Canal and in running preliminary lines for the location of the J lateral system. Four repair crews, consisting of 4 to 6 men each, were engaged in general maintenance work and in installing

structures for the Upper Van Brimmer Drainage District.

On May 10 bids were opened for the construction of the diversion dam on Lower Lost River. Four bids were received, the low bidder being W. D. Miller, of Klamath Falls, Ore.

A crew of about 80 men was employed on the precast flume job on the C Canal. During the month 217 flume sections, 4 feet 3 inches long, 80 bents, and 80 sets of stringers were poured. The concrete placed amounted to 565 cubic yards.

On May 16 the California-Oregon Power Co. resumed operations on the construction of the Link River Dam. The company now has a crew of about 50 men at work building a cofferdam on the west side of the river.

During the past few months a number of corporations were formed for the purpose of drilling for oil. One well, about 10 miles south of Klamath Falls, was drilled to a depth of about 1,700 feet, and drilling was still in progress. It is probable that drilling will be begun on several more wells during the summer.

Former Congressman Rainey, of Illinois, inspected the project on the 25th, and was agreeably surprised to note the progress that had been made in its development. Mr. Rainey was formerly a member of the irrigation committee.—*Herbert D. Newell.*

BELLE FOURCHE PROJECT, SOUTH DAKOTA.

Weather during May was very good for outside and field work. A small amount of precipitation occurred in the form of showers, but not sufficient in extent to cause bad roads. The weather continued quite dry up until the 8th, when about 0.5 inch of rain fell, and

Comparison between operation and maintenance estimates and results, Jan. 1 to May 31, 1921.

Project.	Gross cost.				Accruals.				Area that can be irrigated, 1921.
	Estimate for 1921.		Actual cost to May 31.	Amount *over or under.	Estimate for 1921.		Actual returns to May 31.	Amount more or *less than estimate.	
	Total for year.	To May 31.			Total for year.	To May 31.			
Belle Fourche.....	\$120,000	\$60,000	\$52,000	\$8,000	\$148,000	\$16,500	\$8,000	*\$8,500	<i>Acres.</i> 82,800
Boise.....	335,000	139,500	178,000	*38,500	311,500	(1)	(1)		165,800
Carlsbad.....	50,000	26,400	26,100	300	52,000	20,300	22,900	2,600	25,000
Grand Valley ¹	60,000				61,400				38,350
Huntley.....	75,000	31,500	32,500	*1,000	88,600	5,000	0	*5,000	31,300
Klamath.....	75,000	35,000	32,000	3,000	87,900	10,500	11,700	1,200	52,500
Lower Yellowstone.....	66,000	22,000	25,000	*3,000	66,000	25,000	25,000	0	38,700
Milk River ¹	90,000				45,000				² 74,500
Minidoka.....	134,000	52,500	49,300	3,200	134,000	13,800	5,000	*8,800	49,000
Newlands.....	118,700	65,300	73,000	*7,700	120,600	35,000	39,000	4,000	69,300
North Dakota pumping ¹	58,600				26,800				7,650
North Platte—Interstate.....	275,000	112,000	120,000	*8,000	342,800	26,000	21,000	*5,000	³ 129,900
North Platte—Fort Laramie.....	63,000	21,900	21,000	900	24,000	5,600	5,000	600	14,000
Okanogan ¹	35,000				41,700				8,000
Orland.....	35,000	12,300	17,400	*5,100	41,200	13,400	13,400	0	20,500
Rio Grande.....	242,500	131,000	141,000	*10,000	249,000	103,000	90,000	*13,000	118,000
Shoshone.....	108,600	48,000	41,500	6,500	126,000	14,800	20,000	5,200	65,800
Strawberry Valley.....	87,500	62,600	52,800	9,800	60,300	1,800	700	*1,100	59,100
Sun River—Fort Shaw.....	20,000	9,000	12,200	3,200	26,400	2,500	0	*2,500	12,200
Sun River—Greenfields.....	25,000	10,000	15,400	*5,400	10,000	3,700	0	*3,700	25,100
Umatilla.....	53,000	24,800	22,700	2,100	53,000	15,000	15,800	800	26,300
Uncompahgre.....	145,000	63,000	77,000	*14,000	152,300	45,000	53,000	8,000	100,000
Yakima—Sunnyside.....	135,000	58,600	64,300	5,700	150,500	50,000	53,000	3,000	110,800
Yakima—Tieton.....	92,000	40,000	42,500	*2,500	103,200	19,500	17,300	*2,200	32,000
Yuma.....	233,000	96,000	100,000	*4,000	300,000	115,000	108,000	*7,000	61,300
Total.....	4,231,900	1,121,400	1,195,700	*74,300	2,822,200	541,400	508,800	32,600	1,417,900

¹ Report not received from project in time for publication.

² Stored water is furnished through St. Mary Canal for 21,600 acres additional.

³ Includes 17,000 acres for which water is carried in main canal.

⁴ Total estimated net cost is \$2,652,118.

from that date on light showers were frequent. The wind movement during the month was exceptionally heavy, although no severe storms occurred.

Seeding of small grain was completed and most fields were up to a good stand. Perhaps 50 per cent of the corn area was planted and is coming up nicely. Alfalfa, although somewhat backward on account of the cold weather, promised a fine first crop, especially where irrigated early. Much of the alfalfa area will be left for seed on account of the extremely low price offered during the past few months for alfalfa hay. Beets and potatoes were up to a good stand and gave promise of a fair yield. Crop prospects in general were good. All live stock was in good condition. The droves of sheep owned and wintered on the project were all sent to the range. Shearing is now in progress and the wool clip is satisfactory, ranging from 8 to 12 pounds per animal. No wool buyers put in an appearance and it was not known what the price of wool is likely to be this year. The price of fat hogs and cattle is governed wholly by the Omaha market price.

Water was turned into the North Canal on May 2, and reached the lower end of the project on the 6th. The South Canal headgate was opened on May 5, and water reached the Nine Mile wasteway at the lower end on the 8th. Considerable difficulty was experienced in keeping the canals clear of Russian thistles and other weeds due to heavy winds. No breaks, however, occurred and all orders for water were filled on time. The demand for irrigation water was rather light, although calls enough were made to put all canals in operation. About 75 per cent of the alfalfa was irrigated and a small amount of grain. Light showers occurred at irregular intervals, making a total rainfall of about 1½ inches, which sufficed to keep most of the grain fields in good condition.

A large force was employed throughout the project during practically the whole month completing repairs and replacement of structures and cleaning out small laterals. Little work remained to be done at the end of the month to put the system in excellent condition for operation. The Chas. Wilson wooden chute, about 400 feet in length, was replaced with concrete, and the Butte Hall wooden chute replacement in concrete was almost completed at the end of the month. Other miscellaneous structure repair replacements consisted of three lateral and two main canal checks, one lateral chute, one wasteway gate, and three turnouts. The drag-line excavator was in operation cleaning and enlarging the Newell drain, which serves as an outlet from the old lake bed near the railway station. Six thousand three hundred linear feet of drain were completed, with a total excavation of 4,622 cubic yards, the field cost of which was 19½ cents per cubic yard, including plant depreciation. About 4,600 linear feet through the heaviest work remained to be done. The P. & H. one-half-yard drag line on this work operated with entire satisfaction. The engine gave some trouble, but this was undoubtedly on account of the inexperience of the operator.

Assistant Engineer T. R. Smith, with a party, worked all month on cross sectioning Willow Creek main and sublaterals. Foster Towle, engineer in charge of the Willow Creek work, spent the major portion of the month in the office, figuring quantities and making preparations with reference to construction work planned. Threet Bros., contractors on the Willow Creek lateral excavation, sublet all of the work without necessitating the bringing in of any of

their own stock. One subcontractor with a 20-horse outfit worked the last two days of the month, and the other subcontractors moved in and arranged camp preparatory to beginning work early in June. There were six subcontractors in all, who took from 7,000 to 60,000 cubic yards each.

Owing to instructions that allotment for fiscal year 1922 would be reduced to \$122,000, all plans for letting additional contracts in the Willow Creek division were abandoned. Last month it was stated that only a small crew would be employed in maintenance during May, but as the work progressed it was found advisable to keep rather an extensive crew during the entire month, and there yet remains a certain amount of work to put all of the canals in perfectly safe condition.

During the early part of June the small odd jobs will be completed and the surplus Government stock, comprising probably 16 head of horses, will be put to work strengthening weak points on the North Canal where damage occurred last year from washouts. The construction program was materially changed by reason of the cutting down of allotment for the fiscal year 1922 to very little, if any, more than will be required for operation and maintenance purposes. The only construction work that will be done will be the excavation of main and sublaterals which are now under contract.—B. E. Hayden.

STRAWBERRY VALLEY PROJECT, UTAH.

May weather was generally cool and stormy, with no frost.

Farming operations.—The condition of all crops was excellent. The beet stand was especially good, and the first crop of alfalfa was being cut. Dry-farm wheat was in excellent shape, owing to the frequent rains throughout the month.

Hydrometry.—Delivery of irrigation water was continued under all divisions of the project; 10,461 acre-feet were delivered to the High Line division, and 309 acre-feet to the Springville and Mapleton districts. On the last day of the month the High Line Canal was carrying 225 second-feet of water, and the Spanish Fork River discharging 870 second-feet.

Labor conditions.—All classes of labor continued plentiful.

Operation and maintenance of storage works.—Work on repairs to Strawberry Tunnel was continued throughout the month, when 2,400 linear feet of double fillets and 1,750 feet of new floor were placed and 1,800 feet of cracks in side walls and arch repaired. Forty cubic yards of cyclopean concrete were put in on the apron of West Portal weir. The crushing plant handled 330 cubic yards of material and the mixing plant 313 cubic yards of concrete.

Transportation over Diamond Fork road improved throughout the month, and at the close the road was in good condition between Diamond Switch and West Portal.

Hydroelectric power plant operations.—The power plant was operated without interruption and power furnished the towns of Spanish Fork, Payson, Springville, and Salem.

General.—Work on repairs to exciter turbine unit No. 2 was begun.

The telephone and transmission lines were in good service.

The radial gate at the headworks of Salem and South Field Canals was installed and operated satisfactorily.—W. L. Whittemore.

OKANOGAN PROJECT, WASHINGTON.

May weather was generally warm, increasing to hot weather about the middle of the month. This caused a gradual rise in the flow of Salmon Creek, which reached the flood stage about that time.

The Robinson Flat substation was finished on the 1st, and the pumping plant, which was started the next day, has been in operation, with slight interruption, since then for irrigation of the lands under this division. Two or three men were employed continuously on necessary repairs, in dismantling the emergency generating plant at Omak, taking down the transmission line from this plant to the Robinson Flat pumping plant, and removing from their location at Riverside the two 15 H. P. pumping units, this having been made necessary by the flood stage of the Okanogan River.

Two or three small maintenance crews were kept busy on repairs and replacements to minor structures and the cleaning of a portion of the distribution system.

Water was released from storage for the gravity system on the 10th and the first water delivery for irrigation by gravity was made on the 12th. From that time the gravity system was operated continuously for irrigation. The inflow into the Conconully Reservoir amounted to 5,758 acre-feet and that into Salmon Lake Reservoir to approximately 1,600 acre-feet.

The project orchards were in excellent condition and a good crop in general appeared possible.—*Calvin Casteel.*

YAKIMA PROJECT, WASHINGTON.

The prevailing temperature during May was below normal during the first half, with rising temperature the latter half of the month, and heavy rains on the 16th and 17th, this being the only precipitation for the month. Snow disappeared at Bumping Lake Dam on the 19th, and at Keechelus on the 5th.

Operation and maintenance, Sunnyside division.—The average diversion from the river was 1,215 second-feet, with a maximum of 1,250 and minimum 1,175. Operation of the canal and distribution system was practically continuous, there being only a few short interruptions on account of minor troubles on small laterals. The pumping plants supplying the several irrigation districts were operated to capacity, water service being without interruption except for short intervals to clean pumps or correct minor troubles in their canals and distribution systems. Maintenance work consisted of repair and replacement of small structures, repair of riprap on main and branch canals, and removing trash which gathered in front of the headgates during the high water.

Tieton division.—Diversion from the river was increased during the first 10 days of the month from 225 second-feet to 310 second-feet, the average for the

Crop report, Sunnyside Division, Yakima project, Washington, 1920.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	45,545	Ton.....	193,549	4.25	\$16.00	\$3,096,790	\$68.00
Apples.....	10,510	Pound.....	58,562,163	5,572.00	.04	2,342,486	223.00
Barley.....	716	Bushel.....	20,223	28.00	1.10	22,245	31.07
Beets, sugar.....	1,226	Ton.....	18,390	15.00	13.00	239,070	195.00
Corn:							
Indian.....	5,110	Bushel.....	216,889	42.00	1.00	216,889	42.00
Fodder.....	422	Ton.....	2,485	6.00	6.00	14,910	36.00
Ensilage.....	403	do.....	4,065	10.00	8.00	32,520	80.00
Fruits, small.....	369	Acre.....			300.00	110,700	300.00
Garden.....	2,263	do.....			200.00	452,600	200.00
Hay, other than alfalfa.....	1,690	Ton.....	3,062	2.00	15.00	45,930	27.20
Hops.....	142	Pound.....	187,975	1,324.00	.40	75,190	529.60
Oats.....	359	Bushel.....	16,456	46.00	.75	12,342	34.50
Onions.....	51	do.....	7,225	141.00	.80	5,780	113.33
Pasture.....	5,808	Acre.....			20.00	116,160	20.00
Peaches.....	1,037	Pound.....	337,810	325.00	.05	16,891	16.25
Pears.....	1,610	do.....	4,642,586	2,883.00	.04	185,703	115.32
Prunes.....	321	do.....	2,269,239	7,069.00	.05	113,462	353.45
Potatoes, white.....	3,734	Bushel.....	932,002	249.00	.90	838,802	224.64
Rye.....	91	do.....	1,702	19.00	1.50	2,553	28.05
Wheat.....	4,153	do.....	222,501	53.00	1.75	389,377	99.75
Less duplicated areas.....	6,620						
Total cropped.....	78,940	Total and average.....				8,330,400	105.50

		Areas.	Acres.	Farms.	Per cent of project.
Irrigated, no crop:		Total irrigable area farms reported.....	93,610	2,905	84.51
Young orchard.....	336	Total irrigated area farms reported.....	93,610	2,905	84.51
Young alfalfa.....	3,147	Under water-right applications.....	32,310	1,029	29.15
House and corral area.....	2,916	Under rental contracts.....	61,300	1,876	55.36
Town-site areas.....	1,950				
Irrigated without crop.....	7,272	Total cropped area farms reported.....	78,936	2,905	71.23
Less duplicated areas.....	951				
Total other purposes.....	14,670				
Total irrigated.....	93,610				

month being 300 second-feet. An average of 13 second-feet was diverted from South Fork of Cowiche Creek, and the accrual from the North Fork averaged 5.5 second-feet, with a maximum of 12 second-feet on the 17th, following a heavy rain. Demand for water was lighter than usual for May, owing to the large amount of moisture in the soil at the beginning of the month and the heavy rain of the 16th. Four small maintenance crews were employed, principally on the sub-lateral system, repairing small wooden flumes, non-reinforced concrete pipe lines and telephone lines, removing silt from small sublaterals, renewing wooden division structures and measuring boxes, and miscellaneous maintenance work.

Storage division.—The reservoir gates at Bumping Lake were closed to permit the clearing of debris from the gate racks; at Cle Elum the gates were also closed throughout the month, the water passing over the spillway. At Kachess and Keechelus the gates were operated so as to take care of flood run-off, the intention being to operate the reservoirs so as to have them filled at the end of June.

New divisions.—Work was continued on plans and estimates for the Roza division. A field party was organized on the 16th for continuing main canal location and topography. Funds for this work are provided by the Yakima-Benton Irrigation District under contract dated July 6, 1920.—*J. L. Lytel.*

TIETON DAM.

May weather was favorable for the continuation of construction of the Tieton Dam. The work was con-

finied largely by excavation of the outlet tunnel and core-wall trench, and to the stripping of the dam site. A small amount of work was done on clearing the reservoir site at a point where a sand and gravel plant is to be erected. The hospital, burned last summer, was rebuilt and occupied. Work was begun on a 1,000-kilowatt hydroelectric plant for furnishing power during the construction of the dam. The saw-mill was operated continuously, cutting lumber for construction plants.—*F. T. Crowe.*

RIVERTON PROJECT, WYOMING.

May weather conditions were favorable for construction, except for rains, which fell throughout the month, keeping the roads, especially within 15 miles of camp, in bad condition. The temperature was a little higher than normal.

Drag line 121474 was operated in 2 shifts throughout the month in excavating sandy loam from an earth section with a bottom width of 65 feet and in working on a rock cut where the material was difficult to handle.

Drag line 121322 continued excavating to grade along the side hill, moving shale. This machine completed the shale and ran into sandstone on May 31. It was operated two shifts throughout the month, as was also dragline 121323. The latter was working entirely on earth section, moving sandy loam; it built a section of upper bank and excavated some material along the lower cut stakes, throwing it to the outer portion of the lower bank. Five thousand linear feet of cut-off trench under the lower bank were also excavated.

Crop report, Tieton Division, Yakima project, Washington, 1920.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	15, 118	Ton.....	47, 917	3. 20	\$15.00	\$718, 755	\$47. 55
Apples.....	7, 134	Pound.....	52, 526, 850	7, 360. 00	. 035	1, 838, 450	257.70
Barley.....	1, 012	Bushel.....	32, 281	31. 90	1. 00	32, 281	31. 90
Beans.....	38	...do.....	543	12. 04	3. 00	1, 644	43. 25
Beets, sugar.....	18	Ton.....	289	15. 90	12. 00	3, 468	192. 65
Corn.....	885	Bushel.....	36, 579	41. 30	1. 20	43, 900	49. 60
Ensilage.....	171	Ton.....	1, 518	8. 90	8. 00	12, 144	71. 00
Fodder.....	104	...do.....	612	5. 90	5. 00	3, 060	29. 40
Fruits, small.....	220	Pound.....	465, 595	2, 115. 00	. 125	58, 199	264. 50
Garden.....	310	Acre.....			150. 00	46, 500	150. 00
Hay (except above).....	415	Ton.....	625	1. 50	15. 00	9, 375	22. 60
Hops.....	313	Pound.....	374, 000	1, 195. 00	. 40	149, 000	478. 00
Oats.....	389	Bushel.....	13, 231	34. 00	. 70	9, 261	23. 80
Onions.....	61	...do.....	16, 912	278. 00	. 75	12, 684	207. 95
Pasture.....	1, 210	Acre.....			20. 00	24, 200	20. 00
Peaches.....	590	Pound.....	1, 017, 040	1, 720. 00	. 06	61, 022	103. 40
Pears.....	1, 737	...do.....	4, 840, 500	2, 785. 00	. 04	193, 620	111. 45
Potatoes.....	812	Bushel.....	127, 875	157. 00	. 90	115, 087	141. 75
Wheat.....	2, 873	...do.....	78, 943	27. 50	1. 75	138, 150	48. 10
Less duplicated areas.....	6, 160						
Total cropped.....	27, 250	Tota land average.....				3, 471, 400	127. 40

		Areas.	Acres.	Farms.	Per cent of project.
Irrigated, no crop:		Total irrigable area farms reported.....	30, 600	1, 340	95. 60
Young orchard.....	950	Total irrigated area farms reported.....	28, 000	1, 340	87. 50
Young alfalfa.....	880	Under water-right applications.....	27, 962	1, 337	87. 40
Irrigated, no crop.....	90	Under rental contracts.....	38	3	. 10
Building sites, etc.....	410				
Less duplicated areas.....	1, 580	Total cropped area farms reported....	27, 250	1, 340	85. 20
Total other purposes.....	750				
Total irrigated.....	28, 000				

The total amount of material excavated by the three machines was 83,165 cubic yards, of which 81,083 cubic yards were excavated from the canal prism. Of this material 51,252 cubic yards were Class 1 material, a sandy loam; 25,389 cubic yards Class 2, a hard shale; and 6,524 cubic yards Class 3, a sandstone requiring blasting.

Engineer R. M. Conner arrived on May 4, and immediately assumed charge of all construction and other field work on the project.

The hearing on the organization of the proposed Midvale Irrigation District was postponed from May 9 to June 1.—*H. D. Comstock.*

SHOSHONE PROJECT, WYOMING.

May was a rather cloudy month, with considerable precipitation. The mean temperature was 1° above normal.

Water supply.—The Shoshone Reservoir began to rise on the first day of the month and has been rising ever since, owing to rains and warmer weather in the mountains.

Operation and maintenance.—Owing to the precipitation during the month, which fell mostly in three storm periods, requirements for water on the project were not as large as anticipated. Eighteen thousand

eight hundred acre-feet were diverted at Corbett, of which 8,500 were delivered to the farmers in 550 deliveries for the irrigation of 14,800 acres. The maximum rate of diversion was 614 second-feet. The project has been on an operation basis the entire month. The principal maintenance work consisted of three features: Removing obstruction from closed drains; repairing several siphons under the Chicago, Burlington & Quincy Railroad in the Frannie division, and cleaning the Frannie canal in the Garland division with a small P. & H. drag-line. Three thousand linear feet of canal were cleaned, involving about 6,000 cubic yards of excavation.

Crops.—The work of seeding crops was about completed. Owing to favorable precipitation and cloudy weather, grain and potato crops were doing excellently. Sugar beets and alfalfa were somewhat retarded. There was little activity in the marketing of crops, and no market for alfalfa hay. The following shipments were made during the month: 2 cars of potatoes; 2 of oats; 3 of hay; 1 of alfalfa meal, and 1 of wheat.

Labor.—The labor situation was satisfactory the entire month. The wage for common labor was \$3.50 per day.

Drainage.—The following tabulation shows the progress for drainage excavation:

Machine.	No.	Area.	Drain.	Linear feet.	Cubic yards.	Dates work commenced and completed.
Bucyrus.....	121324	North Garland.....	No. 28.....	7,005	47,437	May 2 to 31, incl.
Do.....	11128	Frannie, part 1.....	No. 103.....	3,165	23,435	May 2 to 20, incl.
Do.....	121472	North Garland.....	Nos. 103 and 102.....	300	2,951	May 26 to 31, incl.
Do.....			No. 27.....	1,365	8,426	May 2 to 6, incl.
Do.....	121475	Frannie, part 1.....	No. 28.....	1,218	5,636	May 17 to 23, incl.
Monighan.....	12426	West Garland.....	Nos. 23-292.....	1,670	10,827	May 24 to 31, incl.
Lidgerwood.....	113210	South Garland.....	No. 104.....	6,395	41,426	May 2 to 31, incl.
P. & H.....	121153	Frannie, part 1.....	Z.....	2,435	16,696	Do
Do.....	121161	O. & M., Frannie.....	X-92-82.....	1,625	5,457	May 2 to 7, incl.
		O. & M., Garland.....	X-92.....	1,715	10,444	May 11 to 25, incl.
			Str. Sage Cr.....	2,670	2,045	May 2 to 16, incl.
			D-56 Wasteway.....	2,197	2,033	May 17 to 24, incl.
			Deep. Frannie C.....	3,000	6,000	May 2 to 31, incl.
Total.....				34,760	182,813	

Field and office engineering.—Field work was carried on by 2 crews on the Frannie division, and 1 crew on the Garland division. One crew on the Frannie division was engaged on topographic surveys and test pit work, in connection with drain studies, and the other crew was engaged upon work incident to drainage and construction. The crew on the Garland division was engaged principally on drainage construction, but also made alternate location for the transmission system from the mouth of Shoshone Canyon to Powell, and some topographic surveys along the line of the proposed siphon from the end of Heart Mountain Canal to Pole Cat Bench.

Construction.—Construction work on the fourth part of the Frannie division was practically completed on the 15th, and the small crew was moved to Deaver and spent the remainder of the month on miscellaneous construction connected with parts 2 and 3 of that division. At Shoshone Dam the main excavation of the power tunnel was completed on the 25th, when the headings met. One hundred and seventy-two linear feet of tunnel were excavated during the month. A start was made near the close of the month on driving the by-pass tunnel, of which 9 linear feet were excavated. One hundred and twenty-five cubic

yards of material were moved from the by-pass open cut at the site of the needle-valve house. The powerhouse site excavation was continued and was from 16 to 18 feet below the river bed, requiring much pumping. Four hundred and seventy-five cubic yards of class 1 and 400 cubic yards of class 3 excavation were moved during the month. This work was nearly completed, and it was gratifying that bed rock was exposed for most of the area of the powerhouse site instead of the sand and loose-rock formation it was expected to encounter. The concreting plant was about ready for operation.—*J. S. Longwell.*

INDIAN PROJECTS, MONTANA.

BLACKFEET PROJECT.

May weather conditions were favorable for crop growth and operation and maintenance and construction work. There was sufficient rain to bring up all of the crops, and a comparatively small amount of extremely cold or severe weather.

Construction work consisted of placing a few minor structures on the Two Medicine and Badger-Fisher systems, and building 27 miles of telephone line from the headquarters office to the Badger-Fisher system.

Crop report, Garland division, Shoshone project, Wyoming, 1920.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	17,140	Ton.....	37,562	2.19	\$8.00	\$300,496	\$17.54
Alfalfa seed.....	34	Bushel.....	16	.47	6.00	96	2.82
Barley.....	175	do.....	4,663	27.11	1.70	7,927	46.09
Beans.....	10	do.....	42	5.09	4.80	202	24.44
Sugar beets.....	1,504	Ton.....	13,467	8.96	12.00	161,604	107.45
Clover hay.....	55	do.....	26	.47	10.00	260	4.73
Clover seed.....	1,385	Bushel.....	3,591	2.59	6.00	21,546	15.56
Corn.....	15	do.....	395	26.00	1.50	593	9.50
Corn fodder.....	18	Ton.....	48	2.70	10.00	480	27.00
Garden.....	262					24,335	92.90
Oat hay.....	117	Ton.....	78	.66	10.00	780	6.70
Oats.....	3,114	Bushel.....	82,384	26.46	.70	57,669	18.52
Onions.....	4	do.....	440	110.00	1.50	660	165.00
Pasture.....	2,508					40,559	16.19
Potatoes.....	1,104	Bushel.....	174,520	158.07	.45	78,534	71.14
Rye.....	14	do.....	350	25.00	3.00	1,050	75.00
Wheat.....	7,385	do.....	154,636	20.94	1.70	231,954	35.41
Miscellaneous.....	6					355	59.00
Total cropped.....	34,850	Total and average.....				929,100	29.70
		Areas.	Acres.		Farms.	Per cent of project.	
Irrigated, no crop:							
Nonbearing orchard.....	40						
Young alfalfa.....	1,040						
Ground fall-plowed.....	70	Total irrigable area farms reported.....	41,384.37		649		
Miscellaneous.....	60	Total irrigated area farms reported.....	35,175.50		649		
Less duplicated areas.....	870	Under water right applications.....	34,599.50		644		
		Under rental contracts.....	60.00		1		
		Water right in litigation.....	516.00		4		
Total irrigated.....	35,180	Total cropped area farms reported.....	34,843.75		649		

Crop report, Frannie division, Shoshone project, Wyoming, 1920.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	2,709	Ton.....	5,345	1.97	\$8.00	\$42,760	\$15.78
Alfalfa seed.....	12	Bushel.....	5	.39	6.00	27	2.30
Barley.....	19	do.....	223	11.73	1.70	379	19.95
Beets, sugar.....	26	Ton.....	125	4.80	12.00	1,500	57.41
Clover hay.....	127	do.....	145	1.14	10.00	1,450	11.40
Clover seed.....	742	Bushel.....	2,013	2.71	6.00	12,078	16.28
Corn.....	23	do.....	256	11.13	1.50	384	16.70
Corn fodder.....	56	Ton.....	66	1.19	10.00	660	11.80
Garden.....	59					4,955	84.00
Hay, oat.....	162	Ton.....	140	.86	10.00	1,400	8.64
Millet seed.....	3	Bushel.....	18	6.00	6.00	108	36.00
Oats.....	1,744	do.....	25,251	14.48	.70	17,676	10.14
Pasture.....	380					3,175	8.37
Potatoes.....	67	Bushel.....	3,865	57.70	.45	1,739	25.95
Rye.....	3	do.....	24	8.00	3.00	72	24.00
Wheat.....	3,130	do.....	30,691	9.82	1.70	46,037	14.73
Spelt.....	8	do.....	140	17.00	1.00	140	17.00
Total cropped.....	9,270	Total and average.....				134,540	16.34
		Areas.	Acres.		Farms.	Per cent of project.	
Irrigated, no crops:							
Nonbearing orchard.....	8						
Young alfalfa.....	2,185	Total irrigable area farms reported.....	18,046.52		261		
Ground, fall-plowed.....	572	Total irrigated area farms reported.....	10,459.68		261		
Miscellaneous.....	940	Under water right applications.....	10,279.68		258		
Less duplicated areas.....	2,515	Under rental contracts.....	180.00		3		
Total irrigated.....	10,460	Total cropped area farms reported.....	9,265.98		261		

The Two Medicine system and the Badger-Fisher system were operated for irrigation, and the Four Horns Supply Canal was operated to divert water from Badger Creek to Four Horns Reservoir. A total of 515 acres was irrigated. The area under cultivation was larger than ever before, and the indications were that the Two Medicine and Badger-Fisher systems will be operated to capacity during the height of the irrigation season.—*R. M. Snell.*

FLATHEAD PROJECT.

At Pablo Feed Canal two lateral turnouts were placed, involving 134 cubic yards of excavation, 50 of backfill, 34 of rock masonry, 20 feet of 18-inch corrugated pipe, and 20 feet of 24-inch concrete pipe.

At Dry Creek headworks excavation amounted to 70 cubic yards; concrete, 45 cubic yards; backfill, 65 cubic yards; and grouted paving, 55 cubic yards.

At Dry Creek Canal clearing and grubbing progressed from station 57+00 to 49+00, a distance of 800 feet. Excavation amounted to 2,511 cubic yards, of which 1,500 were class 1, 911 class 2, and 100 class 3. This work was done between stations 79+00 and 66+00.

At the drop from the canal into the pool above Dry Creek headworks excavation amounted to 100 cubic yards, grouted paving 38 cubic yards, and concrete 2 cubic yards.

All construction was done by Government forces.

Plowing and seeding were completed. Except for grasshoppers, which were in evidence in large numbers, prospects were excellent for a good crop on lands under the ditch.

Live stock was in excellent condition.—*N. B. Hunt.*

FORT PECK PROJECT.

May weather was favorable for construction work. Precipitation was 1.26 inches, making a total for the year of 2.92 inches, which is 1.76 inches less than normal.

Siphon station 268 on Poplar River West Canal B was practically completed as to concrete. The P. & H. drag line cleaned and enlarged about one-half mile of Poplar River East Canal C. On Big Muddy Division a small crew was engaged in backfilling minor structures.

Seeding was practically completed at the end of the month, and crops were in good condition.—*S. A. Kerr.*

GENERAL OFFICES.

Washington office.—Director Davis returned to the Washington office on May 31, after a trip which occupied about six weeks, during which time he visited the Lower Rio Grande Valley for the first time and found there a fine tract of land. The irrigation of this land requires preliminary agreement with Mexico, but physically it is believed that a feasible irrigation project can be worked out to cover about half a million acres of land. Mr. Davis spent a couple of days on the Rio Grande project near El Paso with the officers of the water users' irrigation district and inspected the work in progress at Elephant Butte spillway and embankment. He then inspected the Salt River and Yuma projects, and conferred with the officials of the city of Los Angeles. He visited Boulder Canyon, where surveys are in progress for the storage of waters of the Lower Colorado, upon which the final report to Congress will be made at an early date. After spending two days inspecting the Strawberry Valley project, Mr. Davis went to Green River, Utah, to inspect the work on the investigations of the proposed

Green River project. He then visited the Grand Valley project, conferring with the water users, and inspecting the Orchard Mesa division. Mr. Davis then went to Denver, where he spent a week, in which conferences were held with the officials of the North Platte project and State officials of Wyoming on problems in their State, and with the officials of the cities of Casper and Douglas, who desire a water supply from the Pathfinder Reservoir. He was interviewed by a delegation from Baker City, Oreg., desiring a project undertaken on the Powder River in that State, and returned to Washington on the 31st.

During the absence of the director the office was in charge of Assistant Director Morris Bien, as acting director.

The chief counsel was in the office the entire month. Chief Accountant Gullickson left Washington on May 3 for a trip of about two months to the projects. During his absence C. A. Lyman is acting chief accountant. Mr. Lyman returned on May 1, after spending about two and a half months visiting various projects in connection with the repayment accounts.

Reclamation fund transactions.

[Taken from Washington office records for the month of May, 1921.]

Balance of funds in Treasury (Apr. 30, report)-----	\$854,836.03
Proceeds, sales of public lands (Mar., 1921)-----	74,411.38
Proceeds, sales of town-site lots for third quarter-----	4,048.15
Proceeds, oil-leasing act, past production-----	725,247.70
Proceeds, oil-leasing act, current production-----	85,182.50
Deposits by special fiscal agents-----	248,152.38
Collections by auditor-----	10,496.16

Total-----2,002,374.30

Withdrawals:

Advances to special fiscal agents on requisition-----	763,500.00
Auditor's settlements (disbursements)-----	88,778.00
Total-----	852,278.00

Balance-----	1,150,096.30
April land sales available in June-----	59,116.50
May land sales (estimated) available by June 30, 1921-----	275,000.00
Adjustment of 20 per cent withheld from 1920 sales-----	208,000.00
Estimated proceeds oil-leasing act available by June 30, 1921-----	1,500,000.00
Balance of funds in hands of fiscal agents-----	610,150.00
Estimated total funds-----	3,802,362.80

Balance of funds as shown by United States Treasury books June 11, 1921.

Reclamation fund-----	\$407,642.60
Yuma Auxiliary-----	250,000.00
Blackfeet:	
1919-----	6,981.87
1920-----	2,016.98
1921-----	2,502.22
Flathead-----	150,619.32
Fort Peck:	
1919-----	36,770.32
1920-----	2,359.26
1921-----	2,381.08
Riverton:	
1919-----	1,041.90
1920-----	190.64

Action was taken as indicated on the following letters-submitted to the Secretary:

April 16 (resubmitted on June 2), recommending approval of draft of public notice making applicable to lands in the second division, Salt River project, comprising 20,511.77 irrigable acres, the terms of all

public notices heretofore issued for the project; approved June 3, 1921.

April 23, reporting favorably, with suggested amendments, on bill S. 218, providing for the application of the reclamation law to irrigation districts; signed May 23, 1921.

April 25, reporting, with suggested amendments, on bill S. 536, to encourage the development of the agricultural resources of the United States through Federal and State cooperation, giving preference to ex-service men in employment and establishment of rural homes; signed May 19, 1921.

May 4, recommending that authority be granted to approve the temporary operation and maintenance contract of April 23, 1921, with the King Hill project; that draft of proposed operation and maintenance contract be approved as to form; and that draft of proposed second supplemental construction contract, providing for an additional expenditure of \$400,000, be approved as to form; approved May 9, 1921.

May 4 and 10, reporting favorably on bills S. 670 and S. 488, providing for the exchange of lands between the Swan Land & Cattle Co. and the United States, to correct a mistake in the location of the Lingle power plant, North Platte project; signed May 6 and 12, 1921, respectively.

May 5, recommending approval of organization sheets for the fiscal year 1922; approved May 11, 1921.

May 5, reporting favorably on bill S. 1251, providing for an appropriation of \$20,000 for an investigation regarding the use of the waters in the Green River basin, Wyo., for irrigation purposes; signed May 6, 1921.

May 11, reporting favorably on H. J. Res. 101, authorizing the President to appoint a board for the preparation of a harmonious system of contract forms; signed May 20, 1921.

May 12, recommending approval of H. J. Res. 52, providing for relief of settlers who are more than one calendar year in arrears in their payments; signed May 16, 1921.

May 13, for concurrence of the Commissioner of Indian Affairs and the approval of the Secretary, recommending that the amount of the operation and maintenance charges for 1921 on the Wapato division, Yakima project, be fixed at \$8,000, subject to adjustment in subsequent payments; approved May 18, 1921.

May 14, recommending that authority be granted to make award and enter into a contract with White, Brown & Leahy Co., of Great Falls, Mont., for earthwork and structures for Nelson Reservoir enlargement, Milk River project, amounting to \$97,145; approved May 16, 1921.

May 14 and 24, reporting favorably, with suggested amendments, on bill S. 1649 and bill H. R. 4596, providing for the disposal of waste and drainage waters at the lower end of the Rio Grande project, without incurring obligation for the delivery of any specified quantity of water at any future time; signed May 17 and May 25, 1921, respectively.

May 17, recommending approval of draft of consent of the United States to the inclusion with the Springville Irrigation District, Strawberry Valley project, of certain lands, the greater portion of which are embraced in Utah County Drainage District No. 1; approved May 17, 1921.

May 23, reporting adversely on bill S. 241, proposing to declare Carson Lake navigable, with a cession to Nevada of the rights of the United States to the lands described; signed May 25, 1921.

May 23, reporting adversely on bill S. 242, proposing to declare Virgin River in certain designated townships near the southern point of Nevada to be a navigable stream; signed May 25, 1921.

May 27, recommending that the public notice of December 21, 1920, announcing that the construction charges for certain lands in private ownership on the North Platte project be suspended to December 21, 1921; that irrigation water be supplied during the season of 1921 in accordance with paragraph 2 of the public notice of March 3, 1921, and that water be supplied F. E. Stearns until July 15, 1921, without requiring payment in advance; approved May 27, 1921.

May 28, reporting adversely on bill H. R. 1483, authorizing a preliminary examination to be made of the Colorado River with a view to controlling the flood waters thereof; signed June 2, 1921.

May 28, recommending execution of a contract with Lower Yellowstone Irrigation District No. 2 and Lower Yellowstone Water Users' Association, providing for assumption by the district of the project indebtedness and change of organization from an association to a district; approved June 2, 1921.

May 31, recommending that authority be granted to execute a contract with the Boise Chamber of Commerce, providing for the expenditure of \$10,000 each by the United States and the Boise Chamber of Commerce to carry on investigations of the feasibility of irrigating arid lands in the vicinity of Mountain Home in the Snake River Valley, Idaho; approved June 1, 1921.

Visitors to the Washington office during the month included the following: J. B. Eldredge, attorney for the Payette-Boise Water Users' Association; C. S. Bassett, El Paso; Mark Thompson, Las Cruces, N. Mex.; Toshinae Ikeda, civil engineer, Bureau of Public Works, Government General of Formosa, Japan, regarding engineering matters, including hydraulic fill dams; L. C. Larsen, president of the Snake River Valley Community Club; Ralph E. Twitchell, Santa Fe, N. Mex.; Raul Costemalle, of Uruguay, who will make a six months' study of our projects; and A. C. Cooley, in charge of demonstrations on reclamation projects.

Denver office.—The chief engineer visited the Lower Rio Grande, Rio Grande, Salt River and Yuma projects, Boulder Canyon dam site and the proposed Green River project, Utah, in company with the director, returning to Denver on May 21. Assistant Chief Engineer Chas. P. Williams visited the Flathead, Milk River, Sun River, Shoshone, Huntley, and Belle Fourche projects, returning to Denver on the 23d. Assistant Chief Engineer R. F. Walter left Denver on the 28th for the Strawberry Valley project. Official visitors were Director A. P. Davis, Messrs. D. C. Henny, A. Weiss, and J. N. Beardslee. Other visitors included Gov. D. W. Davis, of Idaho; State Engineers W. F. McClure, of California, A. J. McCune, of Colorado, F. C. Emerson, of Wyoming, R. E. Caldwell, of Utah, J. G. Scrugham, of Nevada, State Water Commissioner W. S. Norvell, of Arizona, State Irrigation Commissioner Geo. S. Knapp, of Kansas, Gov. Robt. D. Carey, of Wyoming, Messrs. Andre Chimel, Degove, Issarte, Feuilly, and Touche, French engineers, H. J. Bentson, of the Austin Machinery Corporation, and J. P. Cordova and H. G. DePartearroyo, Mexican representatives of the International Boundary Commission.

In the designing section designs were prepared for typical drawings, chute drops, Willow Creek lateral system and minor structures, Belle Fourche project; 28 maps and drawings for report on Kinkaid Act investigations, and 14 different preliminary designs for

gravity and arch dams at Boulder Canyon; drawings and preliminary designs for Juniper, Flaming Gorge, and Dewey Reservoirs, Colorado River storage project; preliminary design for earth and rock fill dam at Benham Falls, Deschutes project; drawings for special castings for the Hammett and King Hill siphons, King Hill project; drawings for earthwork and minor structures, Lower Yellowstone project; specifications for structures, Nelson Reservoir South and Bowdoin laterals, Milk River project; specifications for gates, Huntley project; specifications for turnout gates and designs of concrete-pipe culverts, Fort Laramie Canal, North Platte project; detail designs for Wind River diversion dam, Riverton project; preliminary designs for highway bridge over Shoshone River, Shoshone project; specifications for metal flumes, Sun River project; detail designs for structures, Mesa division, part 1, and advertisement and specifications for metal flume, Yuma auxiliary project. Work was continued on standard drawings reported last month.

The principal work done in the electrical section consisted of drawings for repairs and spare parts, Arrowrock balanced valves, Boise project; estimate for permanent pumping plant for Ryan sump, Klamath project; preliminary layout of Thomas Point pumping plant, and specifications for equipment, Lower Yellowstone project; continued power studies under proposed contract with the Idaho Power Co.; tentative designs for bulkhead and auxiliary outlet, North Tunnel, Pathfinder Dam, North Platte project; and continued work on the design of the Shoshone power plant buildings and penstock, Shoshone project. Work was continued on the details of the Yuma B Lift building and substation, Yuma project, and preliminary estimates were prepared for different sizes of power plants at Boulder Canyon.

The principal work in the legal division during the month was the consideration of matters brought up at the conferences held with the director, chief engineer, and others, relative to development in Wyoming and Nebraska. Consideration was given to contracts for cooperative investigations involving the Green River, Mountain Home, Carlsbad Extension, and Cut Bank projects. Forms of contracts were drafted for the purchase of ditch-cleaning machines and for the sale of water to the city of Casper and to the Midwest Oil Co. Consideration was given to the matter of collecting overhead as a part of operation and maintenance under the contract with the Lower Yellowstone Irrigation District No. 1. Numerous leases on the Marias and Bowman projects were canceled for nonpayment of rental. New advertisement was issued for lease of lands on the Marias project.

An average of 446 letters per day was received during the month; 1,177 vouchers were handled, involving a total amount of \$308,634.09. In the purchasing division 448 advertisements were issued and 562 vouchers prepared for payment, involving a net expenditure of \$176,226.61. Transfers between the projects amounted to \$10,684.01.—*F. E. Weymouth.*

HAROLD CONNELLY, 1901-1921.

Harold Connelly, a laborer on the Boulder Canyon investigations, was drowned on May 15, 1921, while swimming in the Colorado River. A search for his body was unsuccessful. The sympathy of the service is extended to Mr. Connelly's father, C. O. Connelly, who lives at Parashant Mountain, Nev.

The Reclamation Record.

Issued monthly by the Reclamation Service, Department of the Interior, under the authority of the Secretary of the Interior.

Copies of the RECLAMATION RECORD will be sent free of charge to any water user on our reclamation projects. The subscription price to others is 75 cents a year, payable in advance. Subscriptions may be forwarded to the chief clerk, United States Reclamation Service, Washington, D. C., and remittances (postal money order or New York draft) should be made payable to the special fiscal agent, United States Reclamation Service. Postage stamps will not be accepted.

Material for publication in the RECLAMATION RECORD should be addressed to *Editor*, United States Reclamation Service, Washington, D. C., and should be mailed in time to reach the editor not later than the 14th of the month in order to insure publication in the succeeding month's issue of the RECORD.

HUGH A. BROWN, EDITOR.

SUBSCRIPTION BLANK.

Reclamation Record.

[To be used only by persons who are NOT water users on the projects of the U. S. Reclamation Service.]

_____, 1921.

CHIEF CLERK,

U. S. Reclamation Service,

Washington, D. C.

DEAR SIR: I am NOT a water user on one of the projects of the U. S. Reclamation Service, but wish to receive the RECLAMATION RECORD each month.

I inclose herewith 75 cents for a year's subscription beginning with the current issue.

(Name.)

(Street and number.)

(City and State.)

(Write plainly.)

NOTE.—Send money order or New York draft, made payable to Special Fiscal Agent, U. S. Reclamation Service. Do NOT send stamps.

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ADMINISTRATIVE ORGANIZATION.

DEPARTMENT OF THE INTERIOR.

Hon. ALBERT B. FALL, Secretary of the Interior.

EDWARD C. FINNEY, First Assistant Secretary.

FRANCIS M. GOODWIN, Assistant Secretary.

CHARLES D. MAHAFFIE, Solicitor for the Interior Department.

CHARLES V. SAFFORD, Administrative Assistant to the Secretary.

CHARLES W. NESTLER, Administrative Assistant to the Secretary.

HARRY G. CLUNN, Private Secretary to the Secretary.

JOHN HARVEY, Chief Clerk and Superintendent of Buildings.

U. S. RECLAMATION SERVICE.

WASHINGTON, D. C.

Arthur Powell Davis, director; Morris Bjen, assistant director; Ottamar Hamel, chief counsel; J. B. Beadle, director's assistant; C. J. Blanchard, statistician; Hugh A. Brown, editor and office assistant; C. A. Bissell, engineer; A. H. Gullickson, chief accountant; Miss H. A. Fellows and Raymond Depue, fiscal agents; C. H. Fitch, chief clerk; Emmet Carr, purchasing agent; G. W. Numbers, appointment clerk; H. N. Bickel, Yakima, Wash., W. A. Meyer, Denver, Colo., and W. F. Kubach, Great Falls, Mont., examiners of accounts.

DENVER, COLO.

F. E. Weymouth, chief engineer, Tramway Building, Denver, Colo.; R. F. Walter and C. P. Williams, assistant chief engineers; Miss L. H. Meisel, secretary to the chief engineer; J. M. Gaylord, electrical engineer; J. L. Savage, designing engineer; James Munn, consulting engineer; J. L. Burkholder, drainage engineer; W. L. Drager, office engineer; J. M. Luney, chief clerk; A. McD. Brooks, purchasing agent; Harry Caden, special fiscal agent.

FIELD LEGAL OFFICES.

Boise, Idaho.—B. E. Stoutemyer, district counsel. Projects: Boise, Minidoka, King Hill, and Jackson Lake Enlargement; R. M. Patrick, district counsel located at American Falls, Idaho.

Denver, Colo.—Law section office of chief engineer; E. E. Roddis and Armand Offutt, district counsel; J. J. Buck, assistant district counsel.

El Paso, Tex.—P. W. Dent, district counsel. Projects: Rio Grande, Carlsbad, and Hondo.

Helena, Mont.—W. J. Egleston, district counsel, Helena, Mont. Projects: Blackfeet, Flathead, Fort Peck, Huntley, Milk River, St. Mary Storage, Sun River, North Dakota Pumping, Lower Yellowstone, and Shoshone.

Mitchell, Nebr.—J. N. Beardslee, district counsel. Projects: North Platte and Belle Fourche.

Montrose, Colo.—J. R. Alexander, district counsel. Projects: Great Valley, Uncompahgre Valley, and Strawberry Valley.

Portland, Oreg.—H. L. Holgate and D. G. Tyree, district counsel. Projects: Yakima, Okanogan, Umatilla, and Klamath.

San Francisco, Calif.—Henry A. Cox and A. B. Fullerton, district counsel, 349 Pacific Building. Projects: Salt River, Yuma, Orland, and Newlands.

PROJECT ORGANIZATION.

Belle Fourche Project.—B. E. Hayden, project manager, Newell, S. Dak.; R. C. Walber, chief clerk; August Lewin, fiscal agent.

Boise Project.—J. B. Bond, project manager, Boise, Idaho; C. C. Fisher, engineer; E. R. Mills, chief clerk; C. F. Weinkauff, fiscal agent.

Carlsbad Project.—L. E. Foster, project manager, Carlsbad, N. Mex.; V. L. Minter, chief clerk and fiscal agent.

Grand Valley Project.—S. O. Harper, project manager, Grand Junction, Colo.; A. W. Walker, engineer; G. H. Murphy, chief clerk; A. H. Hall, fiscal agent.

Huntley Project.—A. R. McGinness, project manager, Ballantine, Mont.; G. H. Bolt, chief clerk; Miss M. C. Simek, fiscal agent.

King Hill Project.—Walter Ward, project manager, King Hill, Idaho; T. W. Hause, chief clerk; L. D. Eakin, fiscal agent.

Klamath Project.—H. D. Newell, project manager, Klamath Falls, Oreg.; N. G. Wheeler, chief clerk; G. R. Barnhart, fiscal agent.

Lower Yellowstone Project.—L. H. Mitchell, project manager, Savage, Mont.; C. A. Denman, chief clerk.

Milk River Project.—G. E. Stratton, project manager, Malta, Mont.; E. E. Chabot, chief clerk; G. S. Moore, fiscal agent.

Minidoka Project.—Barry Dibble, project manager, Burley, Idaho; Dana Templin, engineer; E. C. Diehl, chief clerk; Miss A. J. Larson, fiscal agent; F. A. Banks, engineer, American Falls, Idaho.

Newlands Project.—J. F. Richardson, project manager, Fallon, Nev.; G. B. Snow, chief clerk and fiscal agent.

North Dakota Pumping Project.—W. S. Arthur, project manager and chief clerk, Williston, N. Dak.; H. C. Melaas, fiscal agent.

North Platte Project.—Andrew Weiss, project manager, Mitchell, Nebr.; H. W. Bashore, engineer, Fort Laramie Division; Paul Rothi, irrigation manager; J. R. Ummel, chief clerk; Miss A. L. Perrine, fiscal agent.

Okanogan Project.—Calvin Casteel, project manager, Okanogan, Wash.; W. D. Funk, chief clerk and fiscal agent; H. J. Gault, engineer, Conconully, Wash.

Orland Project.—A. N. Burch, project manager, Orland, Calif.; E. T. Eriksen, engineer; C. H. Lillingston, chief clerk and fiscal agent.

Rio Grande Project.—L. M. Lawson, project manager, El Paso, Tex.; T. W. Parry, irrigation manager; C. A. Peavey, chief clerk; L. S. Kennicott, fiscal agent.

Riverton Project.—H. D. Comstock, project manager, Riverton, Wyo.; R. M. Conner, engineer; G. H. Baird, chief clerk; J. C. Thrallkill, fiscal agent.

St. Mary Storage Division.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk; H. E. Bruce, fiscal agent.

Salt River Project.—Being operated by the Salt River Valley Water Users' Association; C. C. Cragin, general superintendent and chief engineer, Phoenix, Ariz.

Shoshone Project.—J. S. Longwell, project manager, Powell, Wyo.; J. R. Iakisch, engineer; C. M. Jump, superintendent of irrigation; W. F. Sha, chief clerk; Miss L. C. Drinkwalter, fiscal agent.

Strawberry Valley Project.—W. L. Whittemore, project manager, Provo, Utah; J. E. Overlade, chief clerk and fiscal agent.

Sun River Project.—G. O. Sanford, project manager, Great Falls, Mont.; H. W. Johnson, chief clerk; Miss M. G. Valentine, fiscal agent; G. A. Benjamin, irrigation manager, Fairfield, Mont.

Umatilla Project.—H. M. Schilling, project manager, Hermiston, Oreg.; M. D. Scroggs, superintendent of irrigation; G. C. Patterson, chief clerk and fiscal agent.

Uncompahgre Project.—L. J. Foster, project manager, Montrose, Colo.; A. H. Peach, chief clerk and fiscal agent.

Yakima Project.—J. L. Lytel, project manager, Yakima, Wash.; C. E. Crownover and C. F. Gleason, engineers; R. K. Cunningham, chief clerk; J. C. Gawler, fiscal agent; J. G. Heinz, engineer, Sunnyside, Wash.; J. S. Moore, superintendent of irrigation, Naches, Wash.; F. T. Crowe, engineer in charge construction Tieton Dam, Rimrock, Wash.

Yuma Project.—P. J. Preston, project manager, Yuma, Ariz.; R. M. Priest, superintendent of construction; S. A. Williams, engineer, Yuma Mesa Division; E. R. Scheppelmann, chief clerk; E. M. Philbaum, fiscal agent.

INDIAN PROJECTS.

Blackfeet Project.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk and fiscal agent.

Flathead Project.—C. J. Moody, project manager, St. Ignatius, Mont.; F. F. Smith and N. B. Hunt, engineers; J. M. Swan, chief clerk; J. P. Siebeneicher, fiscal agent.

Fort Peck Project.—S. A. Kerr, project manager, Poplar, Mont.; Henry Berryhill, chief clerk and fiscal agent.



STRAWBERRY VALLEY PROJECT OFFICE AND EMPLOYEES.

Left to right: W. L. Whittemore, project manager; J. E. Overlade, chief clerk; T. R. Smith, instrumentman; Mrs. Norma S. Taylor, under clerk; Miss Myrth Johnson, under clerk; Reno Strong, garage man; H. R. Pasewalk, costkeeper; F. D. Helm, junior clerk

The Reclamation Record

ISSUED MONTHLY BY THE RECLAMATION SERVICE
DEPARTMENT OF THE INTERIOR, WASHINGTON, D. C.

Better Farming : Better Business : Better Living

THERE CAN BE NO SURE INSURANCE FOR THE NATION THAN TO PUT ITS MEN UPON THE SOIL

VOLUME 12, No. 8

PRICE ^{FREE TO OUR WATER USERS}
~~SEVENTY-FIVE CENTS A YEAR TO OTHERS~~

AUGUST, 1921





OKANOGAN PROJECT AND SALMON LAKE DAM OFFICE AND EMPLOYEES.

Left to right: Calvin Casteel, project manager; Donald W. Dodge, watermaster; W. D. Funk, chief clerk; Ray Dolsen, stenographer; Dale Thorp, costkeeper; V. W. Russell, assistant engineer; H. J. Gault, engineer; William F. Kubach, examiner of accounts.

IRRIGATION HAS HELPED MATERIALLY TO PRODUCE THESE RESULTS.

Klamath Project, Oregon-California.

By Herbert D. Newell, Project Manager.

This project is situated in the lumbering belt, and the lumbering industry in and around Klamath Falls has considerable weight in the large amount of business transacted in the towns of this project. No figures have been given relative to the assessed valuations and the wholesale purchases of manufactures as they would not show the results of irrigation, because the lumbering business is responsible for a large part of the business on the project.

YEAR OF 1920.

Values created.

Value of farm lands and improvements on project.....	\$3, 173, 365
Value of live stock.....	888, 734
Value of farm equipment.....	262, 565
Total.....	4, 324, 664

Value of crops produced 1920.

(Including Warren Act lands and Tule Lake leased lands.)	
Alfalfa.....	\$581, 910
Wheat.....	262, 135
Pasture.....	58, 518
Potatoes.....	51, 109
Hay.....	120, 230
Barley.....	178, 863
Oats.....	65, 236
Rye.....	87, 241
Garden.....	9, 600
Total.....	1, 414, 842

Shipment of agricultural products, 1920.

	Car loads.
Barley.....	10
Wheat.....	8
Grain, not otherwise specified.....	48
Flour and mill products.....	15
Hay.....	6
Potatoes.....	2
Live stock.....	68
Total.....	157

Other significant statistics.

Number of farms.....	416
Number of towns.....	5
Population of farms.....	1, 365
Population of towns.....	7, 875
Acres supplied with water.....	55, 066
Acres in crop.....	51, 015
Public schools.....	21
Churches.....	10
Newspapers, daily.....	2
Banks.....	6
Capital stock.....	\$650, 000
Deposits.....	\$4, 500, 000
Number of depositors.....	7, 000
Industries:	
Flour mills.....	2
Creameries.....	1
Railroads..... miles.....	20
Water supply of project: Diversion and storage from Upper Klamath Lake; proposed diversion from Lost River with storage in Clear Lake Reservoir.	

SILO SOLVES WINTER FEED PROBLEM FOR DAIRY FARMERS.

By U. S. Department of Agriculture.

MANY dairy farmers on reclamation projects have failed to realize the full benefits to be obtained from silos as a means of storing and preserving succulent roughage for feeding farm animals, especially at seasons when fresh green feed is not available.

Silos are largely used in the Northwest, particularly in Idaho, western Montana, and Utah, owing to a considerable extent to the efforts of extension workers of the United States Department of Agriculture. In the Southwest silos are not so extensively used, and experts believe that they could be more generally introduced with considerable profit. The silo is adapted to all parts of the United States where corn or sorghums can be successfully grown. Its use at present is confined chiefly to farms where cattle are

kept, although silage is a good and cheap feed for both sheep and horses. Dairy farmers especially have appreciated the value of silage as a milk producer. This is particularly true with herds of 10 cows or more. With a smaller number of cows the relative cost of the silo and silo-filling machinery to the benefits that can be expected is a problem to be worked out in each individual case.

The building of a silo is a considerable undertaking, and usually requires financing and planning some months in advance. In this article, therefore, more attention will be paid to the care and repair of silos already in existence, and to the selection of silage materials and their storage. For those who contemplate building silos, attention is called to bulletins

on the subject which can be obtained from the United States Department of Agriculture on application. These include Farmers' Bulletin 855, "Home-Made Silos"; 825, "Pit Silos"; and 578, "The Making and Feeding of Silage." For farmers in sugar-beet regions, Farmers' Bulletin 1095, "Beet Top Silage," may also furnish a guide to the preservation of a really valuable source of winter feed.

SEVERAL MATERIALS TO CHOOSE FROM.

Briefly covering the subject of construction, it may be said that the common types of silo are concrete, hollow tile, stave, metal, the modified Wisconsin silo, and the wooden-hoop silo. The concrete silo has advantages over the others in the way of permanency and stability, and the disadvantage of greater cost. In dry climates the wooden types will, of course, give longer service than in damp regions.

Concrete silos are built of concrete blocks, concrete staves, or in monolithic style by pouring the material direct into forms. Wood-stave silos are furnished ready to put up by manufacturing firms, and for this reason are more numerous in the United States than any other type. Where it is inconvenient to obtain hoops or lugs for a stave silo, the modified Wisconsin type, or the wooden-hoop silo, is to be recommended. These seem to offer less difficulties for the ordinary contractors, as they are built of materials with which they are familiar.

The modified Wisconsin silo is built of $\frac{3}{4}$ or $\frac{1}{2}$ inch boards, nailed laterally on the inside of studding placed in the form of a circle. The wooden-hoop silo is constructed of matched flooring and wooden hoops. There are two serious objections to the modified Wisconsin silo. One is that owing to the difficulty of bending the sheathing a silo less than 14 feet in diameter is difficult to build, and the other is its unfinished appearance.

PIT SILOS BEST IN ARID REGIONS.

Pit silos are practicable at comparatively small expense in regions where the soil is dry the year around, and they can be built with farm labor. They are also favored in regions liable to hard wind storms, even if the nature of the soil requires considerable mason work to keep out moisture and prevent caving. Pit silos have the advantage of being easy to build. They offer more difficulties in removing the silage for feeding, generally requiring a hoist, and as the only ventilation is at the top, there is more danger from the accumulation of poisonous gasses. Owners of pit silos guard against this danger by lowering a lighted lantern into the silo. If it continues to burn it is safe to enter. Some farmers keep a rabbit in their pit silo, and as long as the rabbit is alive it is safe to enter. As a matter of fact, relatively little trouble has been experienced from this source.

There are some features which are essential to the construction of all silos, and without which silage does not keep in perfect condition. The walls should be air-tight; if lumber is used, it should be well matched and contain no large knots; with concrete silos a wash should be used on the inside consisting of cement or raw coal tar thinned with gasoline. Sometimes the inside wall is paraffined. Care should be taken that the doors fit closely into their frames. The walls should be smooth and plumb, so that, in settling, the silage will not adhere to them. They should be capable of standing considerable lateral strain without cracking or bulging. This is one reason circular instead of square silos are recommended. They must be so deep that pressure from above will thoroughly pack the silage and force the air out. About 24 feet is the minimum height to obtain this result.

The silo should generally be placed outside rather than inside the barn, as it ordinarily does not need protection and takes up space. An outdoor silo is also easier to fill. Though silos are sometimes built in fields or near feeding sheds, the most common location is not more than a few feet from the barn and opening into a separate feeding room. The door of the barn can then be closed and the silage odors kept out of the stable at feeding time. These are matters which require so much preparation that it is unlikely that many farmers will find them of use for the present year's crop, but it may be well for farmers not now having silos to keep them in mind and to send for the department literature and special advice well in advance of the next season.

THE CARE OF THE SILO.

Before filling the silo it is essential to put it in shape for use. The old material adhering to the sides must be cleaned off and the inside occasionally painted. For both concrete and wooden silos a mixture of raw coal tar with gasoline is recommended. The roof should be thoroughly repaired to prevent entrance of rain and snow, and the sides and doors carefully looked over to see that they are sound and air-tight. The foundation of the silos sometimes requires attention, and with wooden silos there is often need of tightening up hoops and staves. Most wooden silos are stayed with guy wires, and these should be kept taut.

Almost any green crop can be made into silage successfully. Considerable care must be taken, however, with hollow-stem plants, such as the small cereal grains, by cutting them fine and packing them firmly to expel the air. Other crops, of which legumes are an example, are deficient in the essentials needed for palatable silage. On the other hand, a few crops, such as the saccharine sorghums, have so much sugar that unless cut at a more mature stage they have a tendency to produce sour silage.



The silo should be located within a few feet of the barn.

Corn is the common silage crop wherever it can be grown successfully. Silage made from it contains a high percentage of digestible nutrients, has a good flavor, is very palatable, and will keep in good condition for years. When it is properly siloed the losses of digestible nutrients from fermentation are smaller than most other crops.

Ordinarily corn should be harvested for the silo about a week or 10 days before it would be cut for shocking; that is, when about 90 per cent of the kernels are dented and at least 75 per cent of the kernels are hardened so that no milk can be squeezed out. At this time the lower leaves on the stalk are turning yellow and the green corn fodder contains 65 or 70 per cent of moisture, which is sufficient for silage. Silage made from corn containing moisture enough for proper preservation is more palatable than that made from corn so mature as to require the addition of water.

SHOCKED CORN IS SOMETIMES USED.

Sometimes there is a delay in filling the silo, and it is necessary to cut and shock the corn. On farms which have a limited silo capacity it is often desired to refill the silos after the silage has been fed out. Dry corn fodder may be siloed successfully, but it is absolutely necessary that a sufficient quantity of water be added to wet it enough so that it will pack well in the silo. Water may be added by allowing a stream from a hose to flow into the blower while filling. In addition it is desirable to sprinkle the surface of the cut material as it is distributed in the silo.

In using the corn harvester the bundles should be made rather small. Two to four horses and one man will be required to run the harvester, which should cut about 6 acres a day. The harvester should not get so far ahead of the haulers that the corn will lose any considerable moisture before it is hauled to the cutter.

The corn ordinarily is hauled to the cutter with the common flat hay frames. A low-wheeled wagon is much preferable to a high-wheeled one. A low hay-rack very commonly used in some parts of the United States can easily be made.

In packing the silage the common practice is to keep the sides slightly higher than the center and to tramp the whole surface thoroughly, especially around the edges. Various contrivances have been used for distributing the cut material. The one commonly recommended is a metal pipe similar to the blower pipe but put together loosely in sections so that it can be swung to place the material anywhere in the silo. In case the material to be siloed has become too dry, water should be added to supply the deficiency of moisture necessary to make it pack properly.

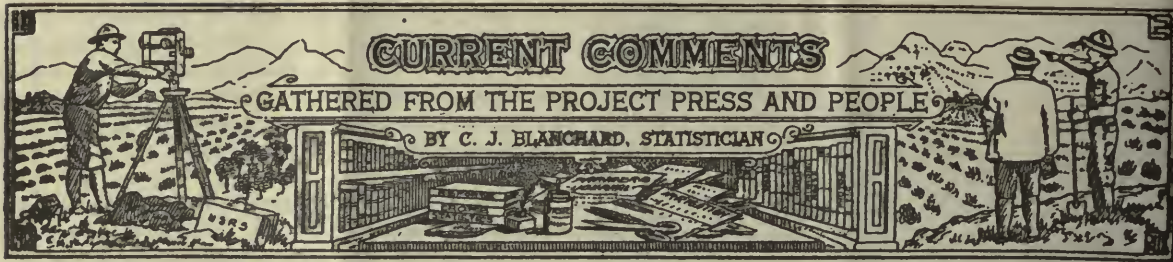
Formerly it was a common practice to cover the silage with some material, such as dirt or cut straw, to prevent the top layer from spoiling. The present means of covering, when any is used, usually consists of a layer of cut corn or sorghum stalks from which the ears or grain have been removed. The heavy green stalks pack much better and exclude the air more effectually than straw. The top should always be thoroughly tramped and then wetted down. Sometimes oats are sown on the top before wetting. The heat germinated by the fermenting mass causes the oats to sprout quickly and form a sod, which serves to shut off the air from the silage beneath. Whenever possible, it is better to begin feeding from the silo as soon as it is filled; if this is done, no covering is necessary and there should be no loss on account of spoiling.

Special information about feeding silage will be found in the Farmers' Bulletin 578 previously referred to.

FORMER SERVICE EMPLOYEE HONORED. Charles A. May, New Mexico State Engineer.

Charles A. May, a former employee of the Reclamation Service, and for the last two years assistant highway engineer of New Mexico, was appointed State engineer of New Mexico by Gov. Mecham on July 14. Mr. May will remain assistant highway engineer and assistant secretary to the highway commission.

In the Reclamation Service Mr. May was employed on several projects, including the Yuma, Strawberry Valley, and Carlsbad. He is a member of the American Legion, Santa Fe Post.



GIVEN a good market and fair prices this fall, our project farmers will be joyful again. From nearly every one of our projects crop reports are most encouraging and the generosity of nature in the form of timely rains has been extended to their neighbors on the dry farm lands above the canals.

The ranges are in fine condition, and sleek cattle and fat sheep are munching the succulent grasses.

In spite of the financial depression, high freight rates, and low prices for farm products, there is much to be thankful for, and optimism among the farmers is growing as they look over their fields and view their orchards.

We look for bumper crops, and with lessened cost of production the outlook warrants cheerfulness.

The shock our farmers received when the bottom fell out of the market was severe; yet most of the intelligent ones realize now that a sharp reaction from the boom prices due to war was inevitable. They are blaming themselves for lack of foresight in not preparing for it while the going was good. During the years of booming markets farmers all over the country showed little thrift and prudence. Enormous sums running into the millions were poured forth from their earnings for worthless stocks, large amounts were spent in vacation tours, and extravagance prevailed everywhere. When the sudden tightening up of money came, when prices slumped below the cost of production and loans were not obtainable on even the best securities, the farmer's plight became tragic.

Recovery has been halted by the continuance of strife in all the great foreign market centers. Our abundant surplus crops have moved out slowly and at diminishing prices. Taxes of every imaginable sort have been imposed until the burden of the people is staggering. The farmer suffered most because he was hit first. The prices for what he had to sell fell sharply long before there was any appreciable drop in what he had to buy. Slowly the equilibrium began to be restored. Labor scarcity ceased and a better class of labor became available at more reasonable prices. Clothing, steel, machinery, and other things which the farmer requires showed a lessening in cost, so that dollar wheat did not represent so large a loss when changed into these commodities. The balance is still on the wrong side because of the

failure of the retailer to take his loss on his stocks purchased at war prices. He is still forgetful of the fact that he sold his prewar stock at war prices, and that it is but fair for him to accept a loss on present stocks in order to more quickly bring about a readjustment of conditions.

It is well to emphasize the fact, quite obvious to the thinking class of farmers, that this is the time for better farming. Loose and slipshod methods spell failure. Every acre should be made to produce its maximum yield if that can be accomplished by intelligent effort. The farmer whose fertile acres are cropping only one-half the yields they should because he neglects them is entitled to no sympathy. The difference between minimum and maximum yields on the same project is too wide. An increase of a few bushels per acre, easily obtainable by more careful seed selection and better tillage, would change the farmer's financial condition materially.

As a result of the recent experience one great good has come to many of our projects, and that is the organization for cooperative production and marketing. More thought was given in the West this season to the kind of crops, the acreage planted to each, and to the matter of finding a market than ever before. The individual farmer is merging his interest in associations which by looking ahead have lessened his risks and in many instances have materially improved his revenues. Among these numerous and varied organizations on our projects two have undertaken a new movement—that of publicity. The Mesilla and El Paso associations of the Rio Grande project are launching a real publicity campaign. The purpose of each is to acquaint settlers with the opportunities there and to put before the consuming public the facts concerning the products which the valley has for the market. They propose to make the public familiar with the superiority of Rio Grande Valley pork, mutton, beef, and poultry. They are ready to prove their beans, chili, cabbage, cantaloupe, and fruit the best by test. When you recall what a hard-shell the farmer always has been about advertising, you appreciate what a radical step forward this is. A few years ago the statement that farmers could be brought together to manage a big utility created a lot of mirth. Later, when the Salt River Valley farmers took over the project with cost of \$10,500,000 and began to oper-

ate it successfully, the mirth subsided. Now we have farmers' organizations on several projects in full charge of the operation not only of canals but of power plants, and innumerable associations for buying and selling pretty much everything. Not in time but in progress this is a far cry from the methods which have so long prevailed in agriculture and predicates the ushering in of a new era which is destined to put farming among the most attractive of the professions.

They are waking up on the Flathead after a long sleep. In 1910 thousands of settlers flocked to this charming valley in Montana in one of the biggest land openings since Oklahoma days. Conditions for which the settlers were in nowise responsible held back development. The progress of reclamation was retarded by reason of lack of funds, drought cut down production on dry farm areas, and for a time discouragement prevailed generally. Now that water has been brought to many thousands of acres and the fertility of the soil has been attested by abundant crops a marked change is apparent everywhere. The valley is Montana's beauty spot. The charm of the lofty mountains which almost completely surround it, the picturesqueness of the numerous lakes, its laughing, tumbling streams, its forests of magnificent timber, its remarkable climate, and its broad areas of virgin and productive soil constitute a galaxy of attractions which have only to be exploited to make this the mecca of a new army of homeseekers. Keep your eyes on Flathead Valley, for big things are going to happen here from now on.

The Northern Pacific Railway Co., which furnishes the transportation facilities for the project, pays a deserved and eloquent compliment to the Flathead Valley in a beautifully illustrated booklet just issued by the passenger department. We should like to see this booklet in the hands of every homeseeker in the land.

In the regional districts of the vocational training board several thousand partially disabled ex-service men are receiving instruction in farming. Many of these men have now completed their course and are ready and willing to apply their knowledge to practical ends. They want land, but unfortunately they are without funds to purchase. Recently we were present at a conference with the officers of the board and ascertained a number of interesting facts concerning these men, most of whom were on farms previous to the war. They are incapacitated in various ways, but each is able to undertake farming of one kind or another. Many are anxious to try poultry and bee raising, others would like to go in for fruit or truck, and others, now completely restored to health, are seeking general farming. Now, a lot of talking has been going on about what we should

do for our disabled heroes, but for this particular class little that is practical has been accomplished.

On our reclamation projects there is a lot of land which is not used. We are asking if our project people can not make plans to place some of these men on this land and back them up for a time until they can get a start. Most of these men will draw pensions which will meet their living expenses during the period they are preparing their farms, and after they are fairly launched they should be able to make their payments from the land. This is such a worthy cause, its appeal to our sympathy and our gratitude for what they did for their country is so strong that we anticipate a generous response from our project people. Suggestions or offers will be reported to the board for immediate action. Have you 5 or 10 or more acres suitable for one of these men which you are willing to let him work on?

NOTED HERE AND THERE.

Arizona, Salt River project.—In a recent issue of *Dearborn Independent* we find an interesting and profusely illustrated article on the Wonder Valley by William Atherton Dupuy, the well-known author. Mr. Dupuy came to the Salt River Valley in 1884, a boy of 8 years, and for many years thereafter dwelt there. His recollections of the early days of the pioneers and his comparisons of present conditions with those which made the lives of the early settlers so trying are peculiarly interesting. The author remained in Salt River Valley until he annexed one of its fair maidens, and then cast his lot in the East, where he has achieved no little fame with his facile pen.

That small fruit pays in the Chandler district is shown by the yield harvested by William Dammon, west of town, from 4 acres. He secured fruit which he sold to the Lewis Cannery for \$660, or a little more than \$150 an acre.

Mr. Dammon states that he was put to very little expense in raising or harvesting this crop. He plans putting in grapes, which will yield about \$500 an acre, and is confident that 10 acres of fruit, grapes, and alfalfa, with chickens, can afford a living to a family in this valley.

In spite of the reverses and also in spite of the fact that the postal receipts of the United States as a whole show a decrease for the past five months of 1921, the receipts of the Phoenix, Ariz., office show an increase in postal receipts during this period. The Phoenix gain is said to be the largest of any first-class post office in the United States.

Chandler, Ariz., dairymen are following the example of the Tempe dairymen and are planning the organization of a cow-testing association. An association has also been formed in the Roosevelt district south of Phoenix.

Commercial date growing in the Salt River Valley has taken on a new impetus in the formation of the Phoenix Date Co., which has planted a considerable area of a variety of dates which have proved to be successful in Arizona.

Arizona-California, Yuma project.—Read what an old-timer says about Yuma and her climate:

"We are fully cognizant that for years we have been made the butt of ridicule for the country because of our supposedly unbearable heat. The old story of the wicked soldier who went from Yuma barracks to hell and sent back for his blankets has been used against us for time beyond counting.

"Once we used to resent that story. Now we welcome it as good publicity. We have come to find people like our dry, hot climate and, what is more, that the heat gives us the longest growing season of any part of the United States. Without this intense heat, almost wholly devoid of humidity, we could not grow 10 cuttings of alfalfa hay per year, as we do, nor could we grow two crops of all grains in one year on the same land."

Yuma's endlessly deep, ages-old silt soil, its natural hothouse temperature, and the water supply from the Colorado, the one big river of the Southwest, gives it all the requirements for extraordinary plant growth. That once maligned desert section is becoming one of the country's garden spots.

California, Orland project.—The Orland high school will incorporate a course in agriculture in its curriculum, beginning with the opening of the coming school year. This was decided by the school trustees at their meeting recently.

The new course is to be instituted under what is known as the Smith-Hughes Act, and the school will receive Federal aid to an extent that will practically cover the cost of the department. The coming year an apportionment of \$1,150 will be available. This amount will be increased during succeeding years, the second year the increase being \$800, the third year an additional increase of \$500, and the third year a further increase of \$300, making the aggregate sum to be received toward the agricultural course \$2,750 per year. This, it is estimated, will be sufficient to carry the agricultural work without cutting into the budget raised in the district.

The new department will, it is believed, bring to the school a large number of students who are desirous of taking a course in agriculture, but who are unable to attend the farm school at Davis. It is expected also that a number of students who now are in the habit each year of going from the local high school to some other institution for their work in this line, will find it to their advantage to take the first work in the special line at home, thus saving the extra expense of study away from home. It will be feasible to take the entire 4-year course of regular

high-school studies here, and also put in an extra year in the lines preparing for a professional agricultural course, making a 5-year course at Orland, practically getting the freshman year's work at home, and being ready to step into the next higher class at any agricultural school the student may choose if he wishes to pursue his work further.

Colorado, Grand Valley project.—The recent tour of the Pure Bred Stock Growers' Association was a great success and has stimulated the interest of stockmen all over the valley. The visiting party was composed largely of Uncompahgre Valley citizens, and an inspection of a large number of ranches made up the day's program. Arrangements were made for the formation of a three-county circuit to promote exhibits at county and State fairs.

Colorado, Uncompahgre project.—Loesch Bros., owners of the Pahgre ranch, are men of vision and with unbounded faith in the valley of their adoption. During the many years we have known them they have followed out a definite plan of development, and their accomplishments are acknowledged by all the valley farmers as noteworthy. A visit to their beautiful mesa ranch is a treat for the lover of fine stock. Here one may view as fine a herd of pure-bred registered Holsteins as can be found in the State. It is the largest herd on the western slope and has been built up by the most patient effort and intelligent selection. Here you can see a 2-year-old heifer which finished a seven-day test of 421 pounds of milk and 17.6 pounds of butter. Here is a cow giving 81 pounds of milk a day, and over in the big barn is a 6-months-old bull valued at \$10,000. Back of this wonderful animal are four generations of dams with records of 1,000 pounds of butter or better a year. From such herds as these the dairy business of the valley is expanding along the right lines.

The old Ashenfelter orchard, the show place of the valley, presents a wonderful picture to-day with its thousands of trees bending under their heavy load of fruit. It is estimated that the yield this year will run all the way from 25,000 to 30,000 boxes. Last year the crop was 50,000 boxes, and the owners did not anticipate a very heavy crop for 1921.

Idaho, Minidoka project.—Rupert's Chamber of Commerce has initiated a boosting campaign for a more general support of local industries and products. A pledge was circulated and signed by 50 of the leading business men that henceforth the goods labeled "Made in Rupert" are to have the first call. The noteworthy products of local manufacture are bread, flour, cheese, hams, ice cream, etc. It is pointed out by the chamber of commerce that although Rupert turns out all these products in quantity and of a quality equal, if not superior, to the imported, the sales of these goods from the outside are greater than of those made at home.

J. J. Meserole and son Leroy, of Fort Worth, Tex., were recent visitors on the project, stopping on their way to the coast, having come by automobile from the Texas city. Mr. Meserole was enthused over the Rupert district. "This is the richest looking community I have seen in my travels from Texas; the best crops and most up-to-date town. Rupert is far ahead of our Texas towns of the same size." This is Mr. Meserole's first trip to Idaho, having resided in Fort Worth for the past 22 years.

Nebr.-Wyo., North Platte project.—By a slight change in the plans for holding the applications for water rights at the September opening of public farm units at Torrington, it is hoped to lessen greatly the delays which occurred at the last drawing. Under the plan proposed the fiscal agent will accept money orders, certified checks, and drafts instead of cash for the first payment. It will be possible then to return the deposits of unsuccessful applicants immediately. Under previous regulations a delay of several days occurred in making return of the deposits, and this worked considerable hardship on the men who filed.

The prospects for a large attendance at the drawing are excellent. There is little likelihood that any units will be available for civilian entrymen after this drawing.

Nevada, Newlands project.—During a visit to the project Prof. Scott, of the University of Nevada, went to H. J. Long's Longheath Farm and ran up the verifications of the tests of two cows of that herd.

Blanar 2d, on a 7-day record, produced 587.7 pounds of milk, with 31.34 pounds of butter.

Carnation Skylark Segis, a junior 4-year-old, gave better than 744 pounds of milk and 31 pounds of butter on a 7-day test. This cow holds the Nevada State record for 2-year-old, 3-year-old, and 4-year-old and touches very closely to the records of California.

These are new records that have never been published and they stand out above everything else in the State of Nevada.

New Mexico-Texas, Rio Grande project.—Five hundred cars of pink-meat cantaloupes will be shipped by Dona Ana County growers this season, as against 1,000 cars shipped last season, according to a report by R. F. Hare, agricultural statistician of the Bureau of Crop Estimates of the United States Department of Agriculture.

Dona Ana County has 1,000 acres in cantaloupes this year, Mr. Hare says. This is less than half of last year's acreage. However, the condition of this year's crop is 100 per cent at present.

Continuing, the report says:

"A preliminary estimate of the acreage of other crops shows an increase of 500 acres in corn over last year. The acreage in 1920 was 9,000. Eight thousand acres are in wheat, as against 7,000 acres last year;

20,000 acres are in alfalfa, as compared with 18,000 acres last year.

"It is estimated that the acreage in cabbage, reported to be 20 per cent less than in 1920, will bring from \$45,000 to \$50,000 to the growers of this county.

"This estimate, made from reports of 250 farms, also shows an increased acreage of oats, barley, sweet potatoes, and beans.

"Last year there was planted 5,000 acres of cotton. This year's acreage will apparently not exceed one-tenth of this amount.

"Crops are generally late, but all show good condition at this time except spring wheat, which will yield less than half the average crop.

"The county will have very few peaches. There will be about 40 cars of Bartlett pears, several cars of apples, and a fair crop of grapes."

Washington, Yakima project.—The Grandview district farmers have garnered and marketed their crop of cherries, and the tidy sum of \$24,000 is their reward.

Tom Owens, of Kirkland, has completed a world's record for both milk and butter in 305 days division on junior 3-year-old, Pietertje Mutual Fobes. F. D. Gano, of Sunnyside, owns the dam of this heifer and the sire is Mutual Fobes Lonfield De Kol.

Mr. Owens also has a junior 2-year-old that is going strong for world's record in 305 days division, Gerben Bracelet Fobes. She now has over 17,000 pounds of milk in 7 months. The present world's record in that division is 17,800. This heifer was purchased from Butchart Bros., of Sunnyside. The Sunnyside people may remember the heifer as shown by Charles Butchart at the junior fair held here last year. The sire of this heifer is Sir Bessie Fobes Tritomia.

A full sister to Gerben Bracelet Fobes, now on test as a junior 3-year-old, Gerben Gracelet Bessie, promises to break the high mark set by Pietertje Mutual Fobes.

William Todd & Sons, of Yakima, are putting themselves among the foremost of breeders in the United States with some of the test records that they are producing.

Wyoming, Shoshone project.—The Shoshone project promises to present a beautiful picture in September, when the drawing occurs for a number of farm units. Nature has given this project a delightful setting amidst the Rocky Mountains, and man has added to its charms by transforming a large area from a silent desert into a prosperous and attractive agricultural community. Back in 1908 these lands were of trifling value even as a sheep pasture; to-day they are dotted with charming homes, the abode of true Americans, whose well-tilled acres are responding abundantly to their toil.

He is indeed a lucky chap whom fortune favors with a lucky number at one of the drawings on this project.—C. J. B.



August Suggestions for Poultry Farmers.

By H. O. Numbers, Poultry Expert, Loretto, Pa.

AN early molt is very probable this season, and we want to offer a few thoughts as to the proper care of molting hens. As a rule, a hen that has been a heavy layer will molt early. By using certain feeds the molt can be retarded or accelerated. Our advice is to let nature take its course. The hen that molts early will lay when eggs are scarce and high. The late molter is, however, the better for breeding purposes. Do not be misled by the old custom of starving the hens during this period. A normal feed of oats chop, corn meal, bran (in equal parts by weight), and 20 per cent beef scrap and oil meal as a mash, will bring your hens out in good style and condition. Many breeders suggest feeding sunflower seed in the scratch feed. Our personal experience has been that the birds do not care for the seeds; hence we prefer the oil meal in the mash.

Keep your pullets growing but avoid fattening if possible, as they are likely to go into an early molt. Plenty of green feed is essential. We treat our pullets as follows: In the morning fresh water and open range; we let them hustle and forage in the cool of the day; at noon we open our feed hoppers until 4 o'clock. Our mash feed consists of equal parts, by weight of bran, middlings, corn chop, oats chop, and 20 per cent of beef scraps. This gives a very palatable ration, and no part is wasted. At 5 p. m. we feed scratch feed of the following component parts: 100 pounds cracked wheat, 100 pounds hulled oats, and 50 pounds cracked corn. We feed all they will clean up before going to roost. Our pullets will be laying September 1; our old hens will be dropping off in egg production, hence we must manage our corn and regular supply of eggs by bringing our pullets to our aid. Do not neglect the oyster shell in the litter for your pullets.

During August you will no doubt pick out your most favorable looking males as breeders. Let us give you one good pointer—don't pick a coward in your flock. In every flock there are a few "bosses." These invariably are excellent breeders, but a coward, one that will not fight and always runs, is absolutely no

good in a breeding pen, no matter what good points he may have. We make this assertion without fear of contradiction, and can back it up by numerous practical tests.

This is about the season when "county fairs" are held. If you contemplate entering for competition, take our advice and don't show anything you want to use as a breeder lest you ruin it. The poultry exhibit may be stuck in some old building poorly ventilated, or in a portable tent, with the blazing hot sun boiling down all day. Unless you are satisfied as to the good accommodations for your birds, better keep away and thereby perform a humane act. We do not intend to discourage "fair exhibitions," but we do want to warn you in advance lest you sustain losses. We can advise you from experience.

We again offer our service to the readers of the RECLAMATION RECORD in assisting you with your poultry problems. Simply write your troubles to H. O. Numbers, Loretto, Pa., and we will answer you through the columns of the RECORD.

Destroying Lice on Dairy Cattle.

On the Newlands project, Nevada, a demonstration was conducted recently for destroying lice on dairy cattle. The material used was kerosene emulsion made in the proportion of 1 bar of laundry soap and 1 pint of kerosene to 5 gallons of soft water. This dip is inexpensive and can be made from materials always on hand. It is free from odors and leaves the animal's skin in good condition and is quite destructive to the nits. This treatment for lice has been found very effective on all classes of live stock.

Buying Cattle for Winter Fattening.

The actual buying of cattle to be fattened during the fall and winter months is a simple matter, but it requires careful judgment on the part of the buyer to know when to buy and what to buy. An animal bought right can usually be disposed of at a profit.

Naturally the best time to buy feeders on the open market is when there is a heavy run and a limited demand. Buy when there is little competition, especially competition between packers and feeders. Early fall buying, one year with another, is usually prefer-

able; especially is this true in soft-corn years. Cattle should be purchased in time to consume the corn-stalk fields and other coarse roughages before severe winter sets in.

In determining what class of cattle to buy, such factors as age, quality, uniformity, and condition of feeders, length of feeding period, kinds and amount of feeds, and market conditions should be considered.

Older cattle make greater daily gains, fatten more quickly and utilize coarser and rougher feeds more advantageously. Young cattle, all feeds considered, make more economical gains but require a longer feeding period. Older cattle usually show more uniformity.

As a usual thing, a good quality animal of any of the recognized beef breeds should be sought for. Feeders showing dairy blood will not do as well as those of strictly beef blood in putting on flesh in the region of the valuable cuts, and are always discriminated against in the market. However, certain conditions will warrant the feeding of common grades. A strong demand for good feeders and a sluggish market on common stuff might mean more profit in feeding the cheaper cattle. Buy the kind that looks like the most for the money.

Dehorned cattle feed out to better advantage, ship to better advantage, and market to better advantage. Get the quality and age to suit, and if you have to take horns in addition, dehorn the cattle when they go into the feed lot. The purchase should be uniform in size, color, and quality. As a usual thing, thin feeders are the best buy. However, for a very short feed, cattle "warmed up" a little should be the better.

Market conditions for certain seasons of the year should help determine the kind of cattle to buy. A certain weight and quality of beef is in demand at certain times of the year. Be familiar with the general trend of the market according to seasons and feed the kind that will be in demand at the time you want to market.

Delay in Treating Hogs Exposed to Cholera Is Costly.

Unless early action is taken to diagnose the cases and apply proper treatment when disease appears in swine herds losses are inevitable. The chances are many that the trouble is cholera, and under such circumstances delay is dangerous, for when that disease has spread and progressed in the herd the loss of many hogs may be expected.

Early attention in an outbreak of hog cholera is essential for the successful treatment of the herd. It has been told repeatedly that antihogcholera serum is not a cure; its use is primarily intended as a preventive agent against cholera, and as such it is universally recognized as the only reliable treatment. Although the serum seemingly has had some favorable

effect when administered to sick hogs in the very early stages of the disease, swine owners should not depend upon the product to save any number of animals after they have developed visible symptoms of hog cholera. The serum is most efficacious when administered as a preventive.

INOCULATE SWINE AT FIRST SIGN OF CHOLERA.

Much of the criticism and unfavorable comment against antihog-cholera serum are due to the fact that farmers delay the use of the product for too long a period after cholera has reached the herd. When many of the animals show symptoms of the disease and the temperature reveals a high fever, it is not reasonable to suppose that serum will do much toward limiting losses. Therefore the warning is again given to treat the animals at the very first sign of cholera in the herd.

Or better still, if there are reasons to suspect that the hogs have been or are exposed to infection, they should be immunized before they have fallen victims. In sections where there are no known outbreaks of cholera there does not seem to be any need for the use of an expensive treatment, but when the disease makes its appearance in the vicinity no time should be lost in having all susceptible hogs given the serum treatment.

Reports indicate that farmers and swine owners are remiss in guarding against the introduction of infection and are generally inclined to expect too much of antihog-cholera serum as a curative agent.

Making \$4 Hay Look Like \$25.

The following excerpt from the report of Project Manager Richardson, of the Newlands project, for the month of June shows the advantage of having high-class dairy cows to dispose of hay at present low prices, in conjunction with a cooperative creamery:

"The marketing outlook for alfalfa hay was very discouraging, the only offers being around \$4 per ton in the stack at the end of the month. The newly organized farmers' cooperative creamery located at Fallon, which is a subsidiary of the old Churchill Creamery (Inc.), started operating June 1 and reports a very satisfactory business. The price of butter fat, which ranged from 30 to 36 cents per pound during June, was very encouraging to those farmers having dairy cows, as their alfalfa hay could be made to bring about \$25 per ton at these prices by feeding it to good grade dairy stock."

The cows that freshen in the fall will produce more milk during the year than those that freshen in the spring, and the largest milk production will come when the prices for milk and butter fat are the highest and labor the cheapest.



How Do You Play?

SHE was a Reclamation Service bride, and on her wedding day she confided that "'We' have made many plans for the future, but one of the most important is an unbreakable rule that there shall be at least three vacations in our family every year—each of us shall have a two weeks' vacation without the other, and then we will have two weeks somewhere together."

Splendid! But, as a disinterested outsider, we would say that if ever it becomes impossible to realize all three recreational periods, by all means let the individual members of the family have their individual vacations and pass up the trip together. Family ties may be ever so warm and close, but the psychology of an absolute change of companions as well as places, the sense of freedom, the prospect of reunion with all the delightful details of travel to relate, all tend to bring about the desired result, a real re-creation.

Then again, hardly any two people have just the same ideas as to what constitutes an ideal vacation. When Heintz invented the fifty-seventh variety he thought he had quite a lot of "kinds," but there are many times 57 ideas of a perfect vacation. Each of these is ideal for the man or woman who likes that kind, but nine times out of ten when a family attempts to take a vacation together some one is going to make a sacrifice.

Time was, not so many years ago, when the rural home program rarely included anything as frivolous as a pleasure trip. It is encouraging to note an improvement in this direction. To-day the wise farmer plans for a little "breathing spell" between harvest time and the fall work. A tent under the cool pines, a mountain lake, hammocks, and fishing poles are something for the family to look forward to during the hot summer days. Send mother to visit her old home or drop her at the summer hotel. Flopping fish and wriggly worms and cooking over a campfire may not appeal to her. She has earned the right to food prepared by other hands, to idle away the hours

in comfortable porch chairs, and to busy her restless hands with the frivolous, dainty embroidery of girlhood days.

Life is hard for the average farm woman. It requires patient endurance; it requires active, hard work; it requires clear thinking and a fine sense of proportion, and it is a business investment, if nothing more, to keep her mind and body in good working order. Even the farm machinery must be laid up occasionally for oiling and repairs. A tired woman is not an enjoyable companion. A tired mother is no inspiration to her children. She needs the calm and poise which only rested nerves and muscles can bring. Moreover, she is entitled to the prospect of a more enjoyable rest than that under a floral emblem sent in by sympathizing neighbors.

How the Japanese Play.

"Who put the 'ease' in Japanese?" queried a humorous person on the car this morning, and it occurred to us that the little people of the Flowery Kingdom really furnish an example to the world in the way they put the ease in all their duties.

Having in mind eternally the honor and glory of their Kingdom, the wise Japanese begin its construction at the very foundation. They start with the children who will soon be their successors, and supervise their play with an object in view. Each little duty is accomplished with a delightful ceremony until they can hardly choose between work and play and duty which make up the three sides of the beautiful, many-colored prism of life.

Supervised play constitutes a relatively large portion of their lives. Two weeks out of every year are given over wholly to national recreation for children. One week is for girls and is called the "Feast of the dolls." The older people encourage the little girls to get out the beautiful dolls that have been handed down in the family for generations. They send the children out to visit each other and inspect these family dolls. They plan outdoor games, tea parties, and dances. Maternal instincts, social duties, and family pride are fostered amid general rejoicing.

The boys' week is called the "Feast of the fishes." The carp fish is the emblem of the youth of Japan. It is small, like the Japanese, but it is so strong that it can swim against the tide and even up waterfalls. Only dead fish, they are taught, drift with the tide. The fish is hung before the door of every Japanese boy during the "Feast of the fishes" week. And to help him become the type of man symbolized by the carp, he is taught, through games and tests of skill, to see clearly, to run swiftly, to think keenly.

It was rather a shock to Americans when one-third of our men who enlisted in the World War were rejected on account of physical defects, but it is doubtful if anyone was shocked sufficiently to do anything about it. This condition could not possibly obtain in Japan, and it would not be possible here if every individual could realize the value of play in helping American children to become healthy, efficient citizens through supervised recreations.

Who'll help put the "can" in American?

How One Woman Told the Story of Reclamation.

Miss Ethelyn Glasser, secretary of the Idaho Reclamation Association, gave an address on Reclamation before the National Federation of Women's Clubs which met at Salt Lake City recently. Commenting on the speech, one of the large western newspapers said: "It makes us just a little prouder of the West and of western women." Miss Glasser said in part:

You would not be here to-day were it not for reclamation. There would be few railroads, no automobile roads, no wonderful hotels, no play times in national parks, no sunny "southern California" for you. It is all because of the humble farms that border these valleys, farms made possible by reclamation that the West is the wonderful West of to-day.

In the broad breasts of our western mountains God stores up the white fountains of life for this country. When summer suns release these streams, if unchecked, they rush in wasted torrents to the sea. But the Hand that drifts these snows upon the mountain peaks has also hollowed the great reservoir sites that the puny hands of man could never fashion.

Most of the easier projects possible to handle by private capital have already been constructed, yet we have touched only the edges of our irrigation possibilities. In southern Idaho alone there are 5,000,000 more acres capable of irrigation; and most of the arid States have the same possibilities.

To me it is not in the least strange that women should be interested in reclamation. We are all natural-born reclamationists, although we may never have heard the word. Every woman who has made a delicious salad out of bits too good to throw away is a reclamationist. Every woman who has made a useful garment out of a cast-off is a reclamationist. Perhaps the first historical record of a woman reclamationist is that of the Hebrew mother who, at the risk of her own life, hid among the rushes the babe that to this day all men renown as one of the great leaders of men.

The Persian and Chaldean Empires were founded on irrigation; the splendor of old Peru was fed by irrigation;

Nile's great gift to Egypt is but a crude, rudimentary, natural irrigation. When I tell you, and truly, that all these wonders are dwarfed; that the Hanging Gardens of Babylon, the temples of the Incas, are but trinkets, the fellah's clumsy cultivation after the footsteps of Father Nile but a mud pie compared with the possibilities of your own Westland, perhaps you may grasp a little clearer concept of what this development will mean to our whole nation.

To show you what this young West and Uncle Sam can do together, let us look at the Minidoka project in southern Idaho, which was constructed at a cost of \$5,800,000, over a million of which has already been paid back into the National Treasury. Government records show that in 1919 alone crops raised on this project were worth more than the entire cost of construction, and this money was spent mostly for goods manufactured farther east.

Doesn't your heart beat a little faster with pride at the splendid courage and vision of it? Don't you want to help us fill all these deserts with roses and golden grain and the laughter of happy children? The lifeblood, the very existence of this country is reclamation.

Camp Fire Girls Undertake Beautiful Work.

The enterprising young women who make up Lakawanna Chapter of Camp Fire Girls on the Grand Valley project, Colorado, have again taken up the work they did last summer—that of taking under their direction the care of the pauper cemetery on Orchard Mesa.

The cemetery association have given what care they could to the cemetery as a whole, but the pauper section has at times been neglected, and the Lakawanna Chapter girls have undertaken to see that they are given care; that the graves of those who died friendless may be as trim and neat as are those in the rest of the cemetery.

Home Beautification.

Not long ago Kansas City realtors made a comprehensive study and report on the financial and economic results of the investment of \$20,000,000 in 30 years by Kansas City in parks and boulevards. The report was to the effect that for every dollar invested \$3 has been brought from the outside into the city as the direct result of the investment in beauty and in recreation grounds. The realtors agreed that \$60,000,000 could be traced as having been invested in Kansas City by people who had been attracted to the city as a desirable place of residence because of the evidence of intelligent, progressive, constructive city building.

Beautifying your premises, whether in city or country, is a double-barreled investment, and results not only in increased happiness and contentment but in greatly enhanced property values. It is mighty poor business to neglect such an obvious opportunity.

In one of the dry-farming counties in New Mexico the ranch women have shown their interest in improving their surroundings by carrying out a well-defined

project of home beautification. Through the assistance of the home demonstration agent these women during 1920 bought, planted, and cared for 1,800 rose bushes in 21 home gardens. The roses include varieties which had never before been tried in that section. They had had a two years' growth in a desert region of California and so were accustomed to the type of soil to which they were transplanted. They claim that the beauty and fragrance of these roses tend to weld the people more closely to their ranch homes and thus make for more permanent agriculture.

The Seventh Annual Rose Exhibit for the Minidoka project, Idaho, was held recently at Rupert, and more than 40 varieties, including almost everything from ramblers to delicate monthly roses, were shown. The usual prizes, consisting of ribbons and vases, were awarded. These shows are becoming popular events in that section, and bring many visitors from points outside the project borders, who are charmed with the profusion of beautiful blossoms.

Summer Course in Home Economics.

On the Sunnyside Division of the Yakima project, Washington, 25 school girls are taking summer courses in sewing and millinery, and 11 are taking instruction in cooking. The work is a continuation of the regular school work and the girls will be given credit for this summer course so that they may devote more time during the school year to the regular studies.

These summer classes are getting advanced work in home economics which is not included in the regular curriculum because of lack of time.

A canning club has also been organized among them and all varieties of fruits and vegetables will be preserved. This work is to be done at home, but demonstrations will be given to those who desire them. Each girl must can 50 quarts of fruit and take part in three public demonstrations. Three girls will be chosen to represent Sunnyside at the State fair in September, and lodging will be furnished on the fair grounds to the successful entrants.

This summer work is not confined to those girls who are taking it for credit, but is open to any girl interested. Those desiring credit must take an examination at the end of the term.

It is encouraging to note that the girls appreciate the opportunities they are enjoying. No previous generation, in this country at least, ever had a chance to take free scientific instruction in this work.

Powell, an up-to-date little city on the Shoshone project, Wyoming, has a new claim to fame. It is proclaimed by local papers to be the first town in the Big Horn Basin to employ a woman for its town clerk. The young lady is Miss Anne M. Jelik, a stenographer and

bookkeeper in a local law office. Her appointment was made through a motion at the town council meeting, which was given unanimous approval.

Queer Ways of Acquiring Pocket Money.

An unusual storm had played havoc among the birds and animals, and two small boys of the family came home with a baby crow, three small half-grown birds, and two tiny squirrels. An article in a recent agricultural paper had contained considerable information about the food of fledglings and wild animals. John had been interested to know that crows thrive on cottage cheese and corn meal, supplemented by worms and tiny bits of raw meat. The squirrels were such babies they couldn't eat regular food, so the children soaked bread in milk and the little things would extract the milk, and they thrived amazingly.

These tiny wild things soon forgot their natural fear instinct and became very tame. The crow received a wonderful education and was sold in the fall for \$2. The squirrels, with their cunning ways and tricks, readily brought \$5 each. One of the little birds was a catbird. Now, catbirds are not generally given credit for the intelligence they really possess, and, after training, the perky little chap brought \$10 from a wealthy woman who happened to make his acquaintance through an automobile accident which took her to the house where this interesting experience was enjoyed.

The next year the children, under guidance, secured a number of birds, squirrels, and other small wild things. They were never allowed to entirely rob a nest, taking only one or two of the babies, and these were tenderly cared for and sold as pets to neighbors and city people. This "pet" farm soon became very well known in the near-by city, so that the market literally came to the door.

One spring there was an inquiry for snails for an aquarium, and immediately a new branch of the industry was opened. Fortunately a good-sized stream crossed a corner of the ranch, and the boys soon found that they could secure snails, frog spawn, tadpoles, small turtles, water plants, minnows, small rockfish, and several other small members of the fish tribe, as well as charming water plants. The first year they made \$22 during the summer vacation from this branch of their business.

An old saucepan fastened to a broom handle, a small net, and a tin pail furnished their equipment. The captives were kept in large agate dish pans and the discarded baby bathtub, and were given fresh river water every day, as well as cistern water does not contain the proper food elements. Every other day earth worms cut into small pieces, lean raw beef cut fine, and corn-meal mush were fed. The bottoms of the pans were covered with clean, fine gravel and river rocks for the plants' support, and in each receptacle one rock or stick projecting slightly above the water was placed for the turtles, etc.

A talk with the city man who runs an animal store will give information concerning a market for the aquarium inmates.

Candied Prunes.

The Hermiston Herald on the Umatilla project is sponser for the following recipe which sounds good enough to try as soon as you can get to the grocer's and back.

Prune candy—the kind that tastes like more—is one of the latest achievements of the famed Oregon fruit. It is made at the horticultural products laboratory of the Oregon Agricultural College, preferably from the dried products.

Small dried prunes are the best. Pit them by hand and fill with English walnut meats. Press back into shape. Dip the prunes, warmed, into sirup made by boiling sugar till it forms air bubbles on the back of a perforated Skinner. On removing fruit take it to a warm room to dry, as a cool place may cause the sugar to turn white and detract from the appearance. Fresh prunes may be used, but take a week to prepare and not so easily candied.

Rice.

Rice is more extensively grown and more widely used than any other foodstuff, and millions of people eat rice as regularly as Americans and Europeans eat bread.

Rice may be made into appetizing dishes for any meal. It is good breakfast food and an excellent basis for soups, substantial dishes, salads, and desserts. It is to be regretted that in many sections of the country it is seldom if ever used, but in many households in the South a dinner would hardly be considered complete without rice served either as the starchy vegetable with meat, or in one of the excellent combinations familiar in southern cookery.

The Government has issued a bulletin on the use of rice as a food, giving many recipes, the testing of which would convert the most indifferent to its use. This bulletin may be had free by writing to the Department of Agriculture, this city, and asking for Farmers' Bulletin 1195, "Rice as a food."—L. L.

If you wish your sow to farrow a good litter do not house her in a closed pen, give her a chance to get plenty of exercise, let her do some rustling for her food, but see that she gets such food as is good for her.

Every poultry raiser should keep a record of his flock. Inventory should be made of the stock at least twice a year and the flock should be charged with the food given it and credited with the production.

MINIDOKA, THE ELECTRIC PROJECT.

A Get Together Message from an Optimist.

By Wm. C. Larsen, President Snake River Valley Community Club.

TO the men and women of Snake River Valley who have turned millions of acres of Idaho's desert into prosperous farms, and to the enterprising business and professional men who have established and promoted its prosperous cities and towns, I want to make an appeal.

Let us all get together in a united and enthusiastic effort to make the world acquainted with what we have to offer the homeseeker and the investor. We have millions of acres yet untouched by plow. We have innumerable openings for capital in the development of manufacturing plants. Our cheap water power, numerous quantities of raw material, and excellent transportation combine to make this valley one of the most promising fields for investment in the West. We have laid a solid foundation for future growth and our untouched natural resources are enormous. Let us combine all the live organizations now existing in a determined effort to attract people and capital.

Every citizen in the valley will be benefited by such a movement. We need most of all a lot of practical farmers to occupy and cultivate our unused lands. We need also new capital to enlarge our industries and assist the farmers in developing their land. All of these can be secured if we but pull together.

SLACK PERIOD ABOUT OVER.

During the past six weeks I have been in Washington and have been in conference with the Government officials who are in close touch with the land, immigration, and financial affairs of the Nation. They are all sanguine that our slack period is about over. They predict a very strong turn to the land and a very liberal attitude on the part of capital toward the farmer. The measures proposed for financing the farmer are soon to be in operation.

Long-time loans and low rates of interest are promised so that farmers and stockmen may be relieved of the uncertainty under which they are working to-day. All these factors are bound to encourage land development and we should be organized as quickly as possible to gain the widest possible publicity to our wonderful valley. My appeal to the people is for everyone to get behind the local chamber of commerce, provide them with funds with which to work efficiently, and back up its efforts with money and personal service. These clubs are only half serving their communities to-day because the public is not cooperating as it should. All the clubs should be brought in close touch with each other and petty rivalry should cease. We must cooperate in promot-

ing the whole valley first. Get the people to come to Idaho, treat them right, let each community present its attractions and advantages as strongly as they can but without knocking any other community. The California idea is to get the man to locate in the State even if he does not come to your locality; once a resident he becomes a booster and brings others, some of whom will choose your section.

THOUSANDS INQUIRING ABOUT LAND.

Director General Husband, of the Immigration Bureau, told me that thousands of immigrants are seeking information about land. He says that his work is handicapped because the regions in which are to be found the most attractive land openings are not organized to assist his bureau. Most of these immigrants have money and are experienced farmers. They would take our own excess lands and develop new areas if we were organized to establish them in our valley.

The South is waking up to the importance of the matter and the landowners in Georgia, North Carolina, Alabama, and Louisiana are combining to cooperate with the Department of Labor. We should make preparations to do the same.

SHOW PICTURE FILMS.

The Idaho reels were shown to Director General Husband and his comment was that our valley should form an ideal place for many of the immigrants he is arranging to put on the land. We can not afford to delay. It is in our own hands to start a movement of settlers to the valley that will bring prosperity to every family in it and give a big boost to all lines of business. I want to see every commercial club start a drive for new members and the farmers should respond as heartily as the business men. We can, if united in the work, secure 1,000 new families for the valley this year. The capital they would bring in would brace up everything and set the valley on its feet securely. Mortgages could be paid off, debts canceled, and business revived. Let's take advantage of our opportunities.

[The above message from Mr. Larsen is equally applicable to all our projects as a program for development. Let us all take advantage of our opportunities, with the water users on each project uniting with the commercial clubs and other civic organizations, to advance the interests of the project to the fullest extent.—Editor.]

If farmers would realize that the annual value of the country's egg crop is equal to the average value of its annual wheat crop—approximately \$600,000,000—and that nearly 8 per cent of the eggs marketed are lost through spoilage or breakage, the industry undoubtedly would be put on a more businesslike basis.

"GET ACQUAINTED" WRITE-UPS.

Charles V. Safford, Administrative Assistant to the Secretary of the Interior.

CHARLES V. SAFFORD was born and during the early years of his life lived in Topeka, Kans., where he received his education. As a young man he moved to Colorado to engage in mining and merchandising. More than 30 years ago he moved to San Juan County, N. Mex., and became established there in similar lines of business.



Charles V. Safford.

Very early in his career in the Territory he identified himself prominently in public affairs, serving two terms as county clerk. From this position he was appointed deputy auditor and treasurer of the Territory. Upon admission of the Territory to statehood, he became traveling auditor and State bank examiner and member of the State board of equalization. In these capacities he served by appointment under four successive governors, when he resigned to become cashier of the Bank of Commerce of Albuquerque.

Eighteen years ago, while auditor and State bank examiner, Mr. Safford became acquainted with Secretary Fall, at that time the attorney general of the State. Their official and political duties brought them in close relationship, and upon the election of Mr. Fall to the United States Senate, Mr. Safford became

his secretary. When the portfolio of the Secretary of the Interior was accepted by Mr. Fall he appointed Mr. Safford as his administrative assistant.

The various positions Mr. Safford has occupied during his long residence in public-land States has given him a broad and comprehensive knowledge of the resources of the West and the needs of its people. He

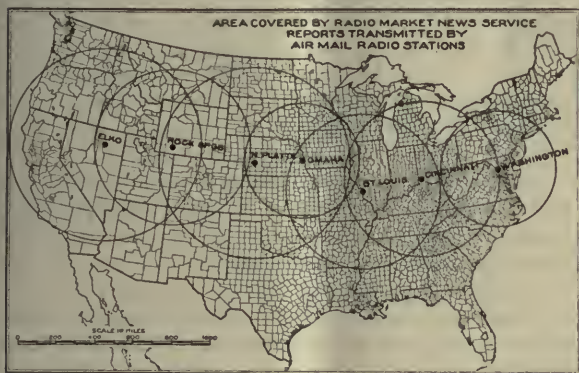
has owned ranches and mines, and has been connected with reclamation projects. He lived many years near Indian reservations and is thoroughly familiar with the departmental problems relating to these wards of the Nation.

Mr. Safford is a thoroughgoing westerner, genial and approachable, and a hard worker.

MARKET NEWS BY WIRELESS.

By Caroline B. Sherman, Assistant in Market Information, U. S. Department of Agriculture.

KNOW Your Markets is a slogan frequently used by the Federal Department of Agriculture and since its organization the Bureau of Markets has endeavored unremittingly to make it possible for farmers and shippers of farm products to know their markets even as men in other businesses know theirs. Various methods have been evolved and applied so that organized farmers who grow and ship in large quantities for several years have been able to keep themselves rather fully informed during the shipping seasons of conditions in competing producing areas and on the large markets of the country.



But how to reach the unorganized and the scattered farmers? That has been the problem most baffling to solve. As a step toward its solution the Bureau of Markets has now in operation a Radio Market News Service covering a band of territory some 600 to 800 miles wide and extending from the Atlantic to the Pacific coast. Radio stations at Washington, St. Louis, Omaha, Cincinnati, North Platte, Nebr., Rock Springs, Wyo., and Elko, Nev., owned and operated by the Post Office Department in connection with its Air Mail Service, have offered their equipment to the Bureau of Markets for the purpose and are now sending out market messages and reports several times a day.

Most of the market news now being sent by radio relates to live stock except in the East where the fruit and vegetable markets are also covered. It is hoped, however, that in the near future the radio news serv-

ice can be further extended, especially in the case of grain. Grain quotations at the present time are sent from Omaha, St. Louis, and Washington.

Obviously, the benefits derived from the bureau's Radio Market News Service depend upon the use the farmers of the country make of it. The reports literally are "in the air" and it is up to the farmer and his representatives to "pull them down" and make use of them.

A number of States, through State bureaus of markets and State extension departments, are cooperating with the Federal Bureau of Markets in organizing their States to receive and utilize radio market reports. In some cases they are considering the establishment of regular information centers to serve as distribution points for sending out the market news through other channels. In other cases progressive agricultural counties are considering the installation of receiving equipment in connection with farmers' organizations so that the information will be available to the county agent for further extension either through the daily newspapers, telephone exchanges, or other agencies.

In many localities individual owners of receiving sets are taking down the reports and putting them to use. Banks are making the information available to their clients. Telegraph operators are placing them on bulletin boards. The first receiver heard from when the first messages were sent out in an experimental way from Washington last December was a high-school boy of 16 years who wrote from his Maryland town that he was taking the messages regularly and supplying them to the local daily paper. Markets by Wireless is the heading carried daily by this paper, which is featuring the column and giving credit to the enterprising boy who makes it possible.

Wireless equipment capable of receiving messages is not expensive compared with other mechanical equipment. The sets cost from \$50 to \$150, and boys and girls of high-school age can become proficient operators with a few months of practice. Mimeographed forms are supplied for use in taking down the reports. The blanks are filled out readily by means of a simple code.

The Federal Bureau of Standards is now testing wireless apparatus for the purpose of determining the

best kinds of equipment farmers and farmers' organizations can secure for receiving radio messages. The cost of equipment is being kept in mind in making these tests, so that the strictest economy can be observed by those making purchases. In a short time the Bureau of Markets hopes to have complete information concerning this matter to pass on to those interested.

Naturally the greatest interest prevails regarding the Radio Market News Service, for its possibilities are boundless and its limitations are as yet uncharted. Inquiries, suggestions, and indorsements come in every mail from all parts of the country covered by the service, and from parts that are eagerly looking for-

ward to extensions that will cover the entire United States. The problems of weather, strays, and dust storms must be studied carefully in the effort to make this service of maximum use the country over as the receiving phase is gradually worked out in detail. The problems are many, but none of them is believed to be insurmountable, and knowledge of the factors governing radio communication is constantly growing. Messages of time and weather have been sent out to all who would receive them, but this is the first effort made by the Government to broadcast wireless information through operators everywhere for quick distribution over the country at large.

FOREIGN VISITORS.

By W. I. Swanton. Engineer, Washington Office, U. S. R. S.

ALMOST from the beginning, the work of the Reclamation Service has attracted the attention of foreign engineers and officials interested in irrigation and flood control. This is no doubt, due in large part to the publicity given the work by the technical press and by such publications as the National Geographic Magazine.

Previous to the World War a large number of officials from foreign countries visited the Washington office of the service and many of the Government irrigation projects in the West, and the eleventh annual report contains reference to these visitors as follows:

Nearly every foreign country having large areas of arid lands has been represented by visitors who have studied the works on the ground, and particularly the methods and analyses of cost. Official and unofficial representatives from Great Britain and its colonial possessions, notably from South Africa and from Australia, have visited the works; also engineers and agricultural experts from various portions of the German Empire, from Austria, Russia, Spain, and other European countries, and from Mexico and South America. These men have been interested not only in irrigation but in the control and conservation of flood waters.

During the war there was naturally a cessation of visits by officials from these countries, but with the resumption of industrial activities there has been a very great increase in the number of visits, and during the last month there has been an especially large number of persons from foreign countries, including Europe, South America, Asia, and Africa, who have called at the Washington office of the service and several of these persons have planned to tour the irrigation projects by automobile.

Of special interest to those in the Washington office is the character of the information desired by these visitors.

One official from a South American country stated that they had complete libraries of all of the latest books, but that he wanted to obtain the very latest data in regard to our engineering investigations that

had not yet been published, and he was very much interested in the experimental data cards and the recent articles in the RECORD on engineering investigations.

One visitor from an Asiatic country desired to know especially about the organization of the service and organization for construction work in the field, together with the methods and costs of operating drag-line excavators, and the article in the July RECORD on the "Results of operation of drag-line excavators," gave much of the information desired. The efficient drag-line excavator used in our drainage work is a constant source of interest to our visitors.

The Hydraulic and Excavation Tables continues to be our best seller and many of the visitors purchase copies of this book and of the little handbook entitled "Measurement of Irrigation Water."

The greatest interest of foreign engineers is in the immense dams that we have built, including the Arrowrock, Elephant Butte, Pathfinder, Roosevelt, and Shoshone Dams, and the project and feature histories containing records of the construction of these important structures are consulted and much of the data copied by these visitors. The supply of specifications of most of these dams has long since been exhausted, and it is necessary to refer inquirers to the technical press through our list of engineering articles and to the recent books by the director on Irrigation Engineering and United States Irrigation Works, which contain specifications or descriptions of many of these immense dams.

The steadily increasing file of project histories is of interest to these visitors, as they give much data on the operation of canals, reservoirs, and power plants not contained in the technical publications.

Many of the visitors desire general information about the extent and location of the Government irrigation projects; others come with questions written

out with great detail. One request, containing 26 specific questions or headings, is as follows:

1. Headworks with weirs and without, and measures to prevent sedimentation.
2. Weirs on great rivers movable parts and sluice gates.
3. Grades, cross sections, velocities, "n" on canals relative to velocities and design.
4. Scouring in canals, machinery used to clean, measures against vegetation; tree planting.
5. Lining canals, oil, concrete, "n," etc.
6. Materials used wood, concrete; alkali action.
7. Wasteways and safety devices—where located, capacity of. Sand boxes, etc. Heads for laterals.
8. Siphons, aqueducts, falls, combination canal structures, roads along banks of canals.
9. Lateral systems, size and design.
10. Duty of water, at entrance of field, and regulation for measurement.
11. Losses of water and raising of ground water.
12. Discharge of drainage canals and measures taken against alkali. Special technical sanitary measures.
13. Organization for settlement, administration and regulations.
14. Regulating works, levees, etc.
15. Silting of fields, raising of water level by inundation.
16. Dams, high concrete, reinforced-concrete, earth, hydraulic-filled; sluice gates. High pressure gates. Influence of reservoirs on climatic and sanitary conditions.
17. Pumping or lift irrigation systems and expenses.
18. Irrigation and hydroelectric works; navigation and irrigation.
19. Hydraulic part of hydroelectric work. Prevention of sand and silt in pipes.
20. Estimates, unit costs, specifications.
21. Organization, contract versus direct management.
22. Machinery factories, earthwork, compacting fills.
23. Machinery other than earthwork.
24. Rebuilding breaks in canals.
25. Legislation, statistics, annual expenses.
26. Reports, description of works, and other special literature.

A file of photographs showing the construction methods employed in building immense dams and canals and the operation of the projects is very complete and is being arranged in convenient form for examination by visiting engineers. When time permits, groups of visitors are shown several reels of motion pictures, of which the service has a large number. Recently a representative from one of the European countries purchased several especially assembled reels of films showing various phases of our construction work to be used for educational purposes in his native country.

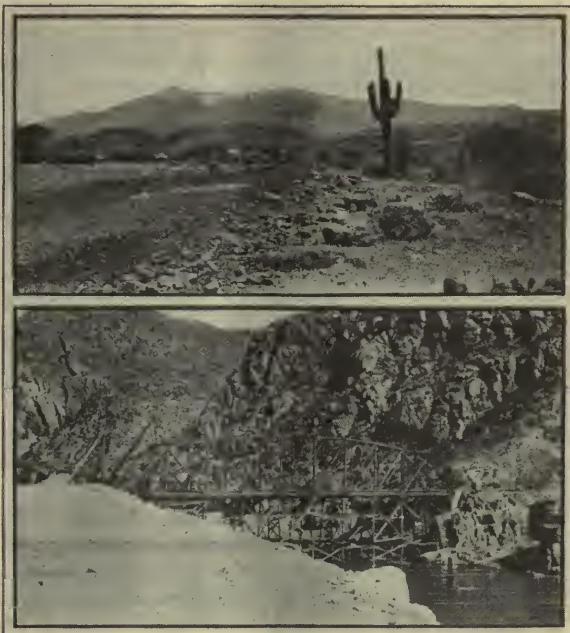
The United States is not the pioneer country in irrigation, power development, or flood control, yet on account of its immense areas, large rivers, and peculiar characteristics it has developed engineering problems of special interest to visitors from these foreign countries and it is with a feeling of cooperation and helpfulness that every effort is made to give these inquirers all the information available on the problems we have encountered and helped to solve in connection with the settlement and development of the arid regions of the Far West.

Work and Save. Buy Government Savings Securities.

SIERRA ANCHA DEVELOPMENT.

By F. E. Bonner, Asst. Chief Engineer, U. S. Forest Service.

IN creating Roosevelt Lake by the building of the great Roosevelt Dam to furnish irrigation water for the Salt River project, Arizona, the Reclamation Service brought into being many incidental attractions of great popular appeal, but the ferry over the east arm of the lake was not one of them. The ford used to cross the Salt River on the road from Globe up into the Sierra Ancha country was gradually encroached upon by the reservoir until the silt deposits from the alternately rising and receding water compelled the abandonment of the ford and the establishment of a ferry. The structure installed was not a particularly seaworthy craft, nor were the natives of this region a seafaring people. Although a great novelty in this part of the country, the style of transportation did not develop popularity. Rough water on the lake meant canceled trips, and no amount of protest could convince the ferry captain that sailors should not confine their labors to eight hours like other people.



Upper: New road and asbestos deposit, from Roosevelt Lake.
Lower: Salt River bridge, practically finished.

The problem has finally been solved by spanning the river with a bridge at the mouth of the canyon just above the outlet to the lake. This bridge, built under a cooperative agreement between the United States Forest Service and Gila County, is a substantial

steel truss of 215-foot span, costing about \$48,000. The work was done under contract by the El Paso Bridge & Iron Co. and the design and engineering executed by the Bureau of Public Roads. The Forest Service and Gila County did not stop with the bridge, but in addition joined hands to replace the old wagon trail with an excellent automobile highway from the bridge to the top of the mountains. The Forest Service first started the road improvement by the construction of 4 miles in 1916, but further work was necessarily deferred on account of the war. Construction operations under the direction of the Bureau of Public Roads were resumed in 1920, however, and the project is now so far along toward completion that it is expected the entire project will be open for travel by the middle of this summer. The new road is 26 miles in length and when finished will represent a total cost of \$224,000, of which \$148,000 will be borne from Forest Service road appropriations and the balance by Gila County.

The construction of this bridge and highway is of great benefit to a large part of southern Arizona. The Sierra Ancha region, which hitherto has been largely inaccessible, is now opened up for public enjoyment. Its attractions consist chiefly of heavily timbered areas, rugged scenery, mountain streams well stocked with trout, and a delightfully cool summer climate. The people of Globe, Miami, and more remote points in the lower arid country will doubtless seek the recreation opportunities afforded in constantly increasing numbers. The east slope of the Sierra Ancha, now accessible by an hour's horseback trip from the new road, breaks off sharply in abrupt cliffs and mighty gorges. Among these are found many ancient cliff dwellings practically unexplored. This part of the region, in scenic grandeur and archaeological interest, is truly extraordinary. Through the building of trails and the development of camp grounds the Forest Service is providing amply for the comfort and pleasure of the tourists; and as the attractions of the region become better known a visit to it will doubtless become a highly popular side trip from the famous Apache Trail between Globe and Phoenix.

The new road is important from a tourist standpoint, but will probably serve even a greater usefulness in commercial development. A large number of people, probably about 150 families, are developing productive farms in these mountain valleys, and hitherto they have been immensely handicapped by the lack of suitable transportation facilities to their market and source of supplies at Globe. Also in the region around Aztec Peak, 12 to 15 miles north from the bridge, there exist what are claimed to be the largest asbestos deposits in the world.¹ One company

STORAGE AT ELEPHANT BUTTE RESERVOIR. RIO GRANDE PROJECT.

By L. M. Lawson, Project Manager, U. S. R. S.

THE Elephant Butte Dam is located on the Rio Grande 120 miles above El Paso, Tex. This is a gravity type structure, and has a height of 306 feet above bed rock. It contains 605,200 cubic yards of concrete, and was completed in May, 1916.

At San Marcial, N. Mex., just above the upper end of the reservoir, where a gaging station has been maintained for many years, the Rio Grande has a maximum annual run-off of 2,422,000 acre feet, a minimum of 200,700, and a mean of 1,152,100 acre-feet. The drainage area above this station is approximately 30,000 square miles.

The irrigable area of the Rio Grande project has been fixed at approximately 175,000 acres. Of this area 25,000 acres lie in the Republic of Mexico and receive water in accordance with the terms of a treaty between the two Governments entered into in the year 1906, which requires the delivery of 60,000 acre-feet per annum in the Rio Grande at the International Dam at El Paso. In 1916, on the completion of the Elephant Butte Dam, the Service was prepared to serve 85,000 acres, 62,000 acres of which were actually irrigated. It is expected that the present season will see 90,000 acres of land irrigated in the United States portion of the project.

The attached diagram shows the hydrographic conditions of the Elephant Butte Reservoir from March, 1915, to December 31, 1920. Although the Elephant Butte Dam was not finally completed until 1916, some water was stored prior to that date, as will be noted from the print.

In August, 1917, as will be noted from the diagram, the inflow at San Marcial decreased to such an extent that the discharge was a very small proportion of the demand for irrigation. This condition continued for the remainder of 1917, and practically all of the year

(Continued on page 373.)

has already done considerable development and, even with the long expensive haul over the old road, has found it possible to market the product at a profit. The extensive asbestos deposits visible at the very top of the high mountain range constitute one of the unusual sights from Roosevelt Lake.

The new road will form the principal artery of transportation into the Tonto National Forest, and it will, therefore, be highly useful to the Forest Service in the management of extensive areas controlled by Uncle Sam and in the protection of the valuable timber resources from fire. Ultimately the road will be improved northward to Young and on to Holbrook on the Santa Fe Trail, thus forming one of the main north and south trunk routes of Arizona.

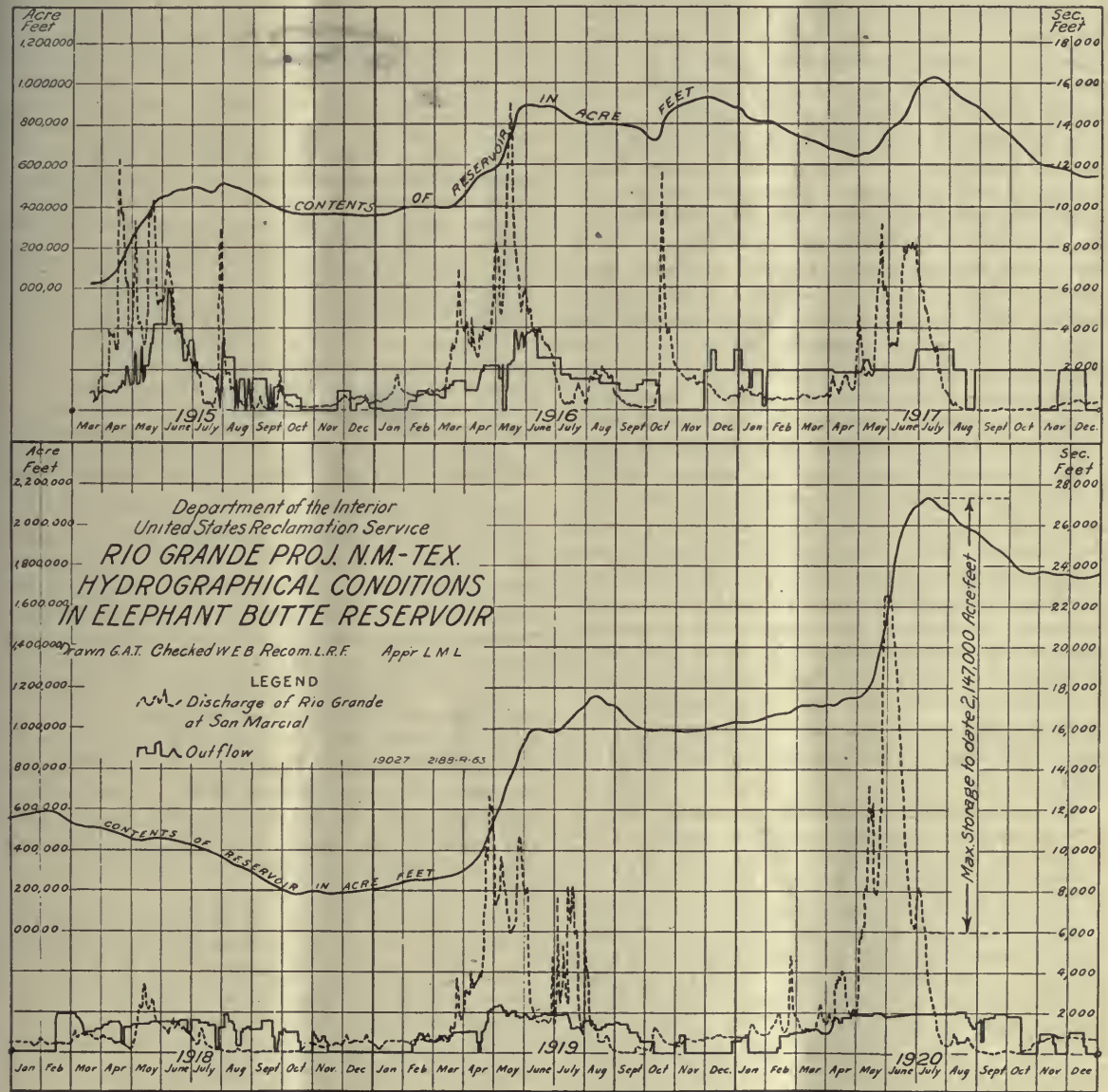
¹ See RECLAMATION RECORD, Dec., 1918, p. 571; article by J. S. Diller, United States Geological Survey, on Reclamation and Asbestos in Arizona.—Editor.

1918, the exception being 30 days in May, when the inflow exceeded the outflow. The spring run-off for 1920, together with inflow from desert rains, replenished the contents of the reservoir considerably. In 1920 the other extreme from drought conditions was present and the discharge of the Rio Grande into the Elephant Butte Reservoir was a record flow. The peak of this flood condition was 23,000 second-feet, which is within 10,000 second-feet of the highest flow on record.

At the spillway elevation, which is 193 feet above the stream bed, the reservoir has an area of 40,080 acres and a capacity of 2,638,000 acre-feet. On July 12, 1920, the reservoir content reached 2,147,000 acre-feet, which is the largest volume stored to date. This raised the

lake surface to within 2 feet of the gate collars of the spillway cylinder gates.

In the relatively short time of five years since the completion of the Elephant Butte Dam it has served the two extreme requirements, namely, that of storage and that of flood control. The crop produced during the period of 1917 and 1918, when practically all the water used for irrigation was drawn from storage, had a value in excess of the cost of the dam. The flood damage which would have resulted from the uncontrolled discharge of the flood of 1920, through the valleys of the Rio Grande above and below El Paso, would have reached an amount also largely in excess of the cost of the structure.





Departmental Construction of Land Law Upheld by Supreme Court.

ON February 9, 1903, Charles W. Rider made homestead entry on a quarter section of public land in Palo Verde Valley, Riverside County, Calif. September 8, 1903, the land was withdrawn by the United States for irrigation works under the act of June 17, 1902 (32 Stat., 388). On February 18, 1908, the land being still withdrawn, L. G. Fleischer filed a contest of the Rider entry, which contest was sustained. By notice dated February 11, 1909, Fleischer was informed of his preference right of entry for 30 days under the act of May 14, 1880 (21 Stat., 140). April 18, 1910, the land was restored to settlement and May 18, 1910, to public entry. On the earlier date John McLaren made homestead settlement on this tract and on the later date both Fleischer and McLaren applied at the local land office to make homestead entry thereof—Fleischer in the exercise of his preferred right, and McLaren in virtue of his settlement. Fleischer's application was allowed and McLaren's rejected and patent was issued to the former on January 15, 1915. McLaren then brought suit in the superior court of Riverside County to have Fleischer declared a trustee for him of the title, and to compel a conveyance in execution of the trust. Fleischer prevailed in the court of first instance, again in the supreme court of the State, and finally in the Supreme Court of the United States. (*McLaren v. Fleischer*, 185 Pac., 967; 253 U. S., 479; 64 L. Ed., 1023; 65 L. Ed., 674). The following is taken from the opinion of Justice Van Devanter of the last-named court:

The sole question for decision is whether the officers of the land department erred in matter of law in holding that, under the act of May 14, 1880, Fleischer was entitled to 30 days after the land was restored to entry within which to exercise his preferred right of entry. The words of the act are: "Shall be allowed 30 days from the date of such notice to enter said lands." Generally when an existing entry is canceled the land becomes at once open to entry and the act is easily applied. But where, as here, an existing withdrawal prevents the land from becoming open to entry for more than 30 days after the notice of cancellation issues, the application to be made of the act is not so obvious, and it becomes necessary to inquire what is intended. Does the act mean

that the preferred right to enter the land is lost if not exercised within 30 days after the notice issues, even though the land is not open to entry during that period? Or does it mean that the contestant shall have 30 days during which the land is open to entry within which to exercise his preferred right, and therefore that if the land is not open to entry at the date of the notice, the time during which that situation continues shall be eliminated in computing the 30-day period? In the practical administration of the act the officers of the land department have adopted and given effect to the latter view. They adopted it before the present controversy arose or was thought of; and, except for a departure soon reconsidered and corrected, they have adhered to and followed it ever since. Many outstanding titles are based upon it and much can be said in support of it. If not the only reasonable construction of the act, it is at least an admissible one. It therefore comes within the rule that the practical construction given to an act of Congress fairly susceptible of different constructions, by those charged with the duty of executing it, is entitled to great respect, and, if acted upon for a number of years, will not be disturbed except for cogent reasons.

Rights of Entrymen Under the Reclamation Law.

Herbert C. Harden brought mandamus suit in the Supreme Court of the District of Columbia to compel the Secretary of the Interior, *inter alia*, to approve his application for a homestead entry under the reclamation law on public land within the North Platte Federal irrigation project, Nebraska-Wyoming. These lands were withdrawn on February 11, 1903, under the second form provided by the act of June 17, 1902 (32 Stat., 388), and on August 10, 1908, they were withdrawn under the first form, under said act. November 28, 1903, they were entered by one Milton Trump, who thereafter and on August 4, 1913, relinquished to the United States all rights to his entry, and the same was canceled. On September 2, 1919, while the lands were still withdrawn, Herbert C. Harden made the entry involved in the suit.

The act of June 25, 1910 (36 Stat., 835), as amended by the act of August 13, 1914 (38 Stat., 686), provides "that where entries made prior to June 25, 1910, have been or may be relinquished in whole or in part, the lands so relinquished shall be subject to settlement and entry under the reclamation law." The entryman, Harden, contended that inasmuch as Milton Trump had entered the lands in question "prior to June 25,

1910," and then relinquished the entry, that Harden had a right to make entry under the reclamation law even though the lands were withdrawn and though he succeeded to no rights by reason of Trump's entry. The Government contended that the amendment in question was intended to and does operate only in favor of original entrymen who became such prior to June 25, 1910, and who relinquished their entries, and in favor of those who claim under, by, and through them, that the legislation was remedial in character and was only intended to protect from the loss of improvements made to land entered those who had been unable, for one reason or another, to carry their entries to patent under the homestead laws, and hence had relinquished them.

In a memorandum opinion dated January 25, 1921, Justice F. L. Siddons decided the case (*U. S. ex rel Herbert C. Harden v. John Barton Payne, Secretary*) in favor of the Government. An appeal has been taken by the plaintiff, Harden.

Enlargement of Irrigation Districts in California.

In the case of *People v. Cardiff Irrigation District* (197 Pac., 384), the District Court of Appeals, Second District, Division 1, of California, has decided the following points relative to the enlargement in that State of irrigation districts:

So far as proceedings for the organization of irrigation districts are concerned, a reasonably liberal rule of construction should be adopted to carry out the wise purposes of the law, and the same rule of construction should be applied to provisions of the statute which cover the changing boundaries of a district and the annexation of additional territory.

An irrigation district organized under the laws of California can change its boundaries and enlarge the district, although it does not own or possess any water supply for irrigation purposes, the original proposed source having failed or having been abandoned, a new source of water supply being contemplated.

The requirement of the Constitution as to due process of law does not give a property owner an absolute right to notice and hearing before his property may be included within the limits of an irrigation district on petition for change of boundaries.

Right to Attack Validity of Enlargement of Irrigation Districts.

Where an irrigation district in California has at least a de facto existence, an action can not be maintained by a landowner individually or on behalf of other owners to have it determined that proceedings for the enlargement of the district are void, and that an assessment levied by the district is invalid, since such an action may only be maintained at the instance of the people of the State, such a cause of action not relating to matters of irregularity in the proceedings of the district for which property owners within the district have a right of action. (*Gray v. Cardiff Irrigation District*, 197 Pac., 389.)

Relief of Ex-Service Men.

An act for the relief of certain ex-service men whose rights to make entries on the North Platte irrigation project, Nebraska-Wyoming, were defeated by intervening claims. (Act May 20, 1921, Public No. 6, 42 Stat., —.)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the ex-service men qualified to make entry under the homestead laws, who were successful at the drawing held March 5, 1920, for farm units on the North Platte irrigation project, Fort Laramie unit, Nebraska-Wyoming, and to whom approved water-rental applications were duly issued, but who were prevented from making homestead entries for the lands covered by such applications because of the reinstatement of certain conflicting homestead entries, shall each have a preferred right of entry under the homestead laws at the next opening of lands under said project, for not less than 30 days before the date set for the opening of such lands to other entry: *Provided*, That this act shall not be considered as entitling any person to make another homestead entry who shall have received the benefits of the homestead laws since being prevented, as aforesaid, from exercising the right acquired at the said drawing on March 5, 1920.

Congressional Bills of Interest to Our Readers.

IN THE HOUSE.

H. R. 6502.—"A bill securing rights of way and easements over public land in connection with Federal irrigation projects," introduced May 23, 1921, by Representative Moses P. Kinkaid, of Nebraska.

H. R. 7161.—"A bill to authorize certain homestead and desert-land settlers, applicants, or entrymen who entered the military or naval service of the United States during the war with Germany to make final proof of their entries," introduced June 15, 1921, by Representative Don B. Colton, of Utah.

H. R. 7259.—"A bill to amend an act approved October 22, 1919, entitled 'An act to encourage the reclamation of certain arid lands in the State of Nevada, and for other purposes,'" introduced June 20, 1921, by Representative John E. Raker, of California.

H. R. 7490.—"A bill to encourage the development of the agricultural resources of the United States and the establishment of rural homes through Federal and State cooperation by the employment and settlement of veterans of the Great War upon the land," introduced June 30, 1921, by Representative William B. Bankhead, of Alabama.

H. R. 7736.—"A bill to revise, amend, and codify the laws of the United States relating to the location of mining claims on the public domain, and for other purposes," introduced July 12, 1921, by Representative Samuel S. Arentz, of Nevada.

IN THE SENATE.

S. 1902.—"A bill to amend Subsection I of section 12 of the act entitled, 'An act to provide capital for agricultural development, to create a standard form of investment based upon farm mortgages, to equalize rates of interest upon farm loans, to furnish a market for United States bonds, to create Government depositaries and financial agents for the United States, and for other purposes,'" introduced May 27, 1921, by Senator William H. King, of Utah.

S. 2105.—"A bill to establish a landschaft system of rural credit in the United States," introduced June 17, 1921, by Senator Morris Sheppard, of Texas.

S. 2170.—"A bill to encourage the development of the agricultural resources of the United States through Federal and State cooperation, giving preference in the matter of employment and the establishment of rural homes to those who have served with the military and naval forces of the United States," introduced June 27, 1921, by Senator Charles L. McNary, of Oregon.

S. 2194.—"A bill to encourage the development of the agricultural resources of the United States and the establishment of rural homes through Federal and State cooperation by the employment and settlement of veterans of the Great War upon the land," introduced June 30, 1921, by Senator William E. Borah, of Idaho.

—*Ottamar Hamcle.*

FISH CULTURE IN CONNECTION WITH THE IRRIGATION PROJECTS.

By Glen C. Leach, U. S. Bureau of Fisheries.

IRRIGATION and fish culture have long been considered antagonistic in their interests, and it must be admitted that in many respects this view is not without substantial foundation. Speaking generally of the intermountain country of the West, the early irrigation projects, combined with the lumbering and mining operations, seriously threatened the certain and permanent decline of fish culture and the complete destruction of the indigenous fishes. In the progress of their development dam after dam and ditch after ditch diverted the waters from their natural courses, and in time the beds of even the larger streams were left wholly dry in summer, the entire water supply being turned into the ditches. Most of the water was absorbed by the arid land and vegetation. Any unconsumed portion seeped back to the river bed turbid and yellow, only to be again diverted as soon as enough had accumulated. In certain places there was scarcely a drop of water that had not been passed over the fields from one to ten times.

Under such conditions great numbers of trout and other valuable species of fish entered the irrigation ditches, and many thousands of them annually perished in the fields. This excited only casual comment, as the irrigationists were not interested in fish and resented the efforts put forth by the comparatively few to prevent the enormous loss involved. The installation of screens in the ditches meant to them additional expense and much labor to keep them free of drift. The land was valueless without irrigation and they regarded the economic value of the fish as trifling compared with that of the water privilege, the potential value of the fish not being generally recognized.

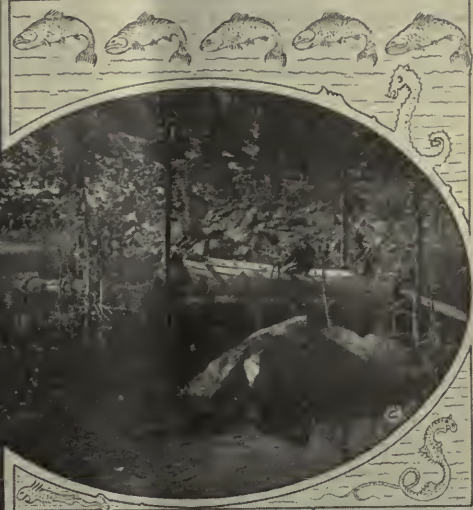
It very soon became apparent that only a small portion of the accessible land could be irrigated from the natural flow in the streams, and the storage of flood waters was resorted to. Following preliminary investigations and surveys reservoirs of varying sizes were constructed—small ones at first, built by local enterprise; then larger undertakings, financed by outside capital, and later on the gigantic projects of the United States Reclamation Service.

Many of these reservoirs were promptly stocked with fish, and the ensuing results have in many cases

been remarkable. Not only is the native trout found in the clear cold mountain waters, but the brook trout of the East and the rainbow trout of the Pacific slope have also become so well established there'n as to be considered indigenous by many. In this environment these two species have attained a degree of excellence very rarely found even in their native habitat. The larger bodies of water created for storage purposes have thus become valuable assets to fish culture not alone through the fish actually propagated in them but to a greater extent through the large supplies of spawn that are derived from them for incubation in hatcheries operated by the various States, by the Federal Government, and by private fish culturists, the output of young fish from all these establishments eventually entering into the general distribution.

In Colorado the Bureau of Fisheries at the present time finds in the lakes constructed for irrigation work its most prolific source for brook-trout eggs from wild fish. In Utah important fish-cultural operations are conducted jointly by the bureau and the State fishery authorities at Strawberry Reservoir, while the Pathfinder Reservoir, in Wyoming, offers possibilities along the same line that the bureau plans to take advantage of as soon as funds for the purpose can be obtained. Another important feature of storage reservoirs in their relation to fish life is that they prevent to a great extent the spring floods to which all mountain streams are naturally subject, and tend to bring about a more equable flow of water throughout the year.

It is not intended to convey the idea that conditions with reference to the irrigation projects are all that they should be at the present time. There is a wide field for improvement, and as the problem bears on the natural resources of the country, it should have the thoughtful attention of both National and State officials. To apply large sums of money to the production of fish through State or National agencies and then allow them to go to certain destruction in the irrigation ditches is not only a criminal waste of funds, but it clearly demonstrates the inability or negligence of the constituted authorities to comprehend and safeguard the interests of the public. Practical devices are available for the



1 TAKING SPAWN FROM WILD TROUT HELD IN LIVE CARS ABOVE A RACK
2 FYKE NETS FOR CATCHING WILD TROUT FOR SPAWNING PURPOSES. ROCKY MOUNTAINS



3 MAKING A PLANT OF FISH IN PUBLIC WATERS. THE TEMPERATURE OF THE WATER IN THE CAN, IS BEING EQUALIZED WITH THAT OF THE STREAM BEFORE THE FISH ARE LIBERATED.



4 LOADING A BUREAU OF FISHERIES CAR WITH FISH FOR DISTRIBUTION.
5 PLANTING TROUT FRY IN A STREAM IN YELLOWSTONE PARK.
6 SEINING WILD TROUT FOR BROOD STOCK IN ROCKY MOUNTAINS

exclusion of fish from these ditches, at a minimum expenditure of labor and funds, and failure to provide them where needed, or to install fishways over dams to enable fish to reach their natural spawning grounds in the waters above, is inexcusable. By the intelligent observance of a few simple requirements the interests of the two important measures of irrigation and fish-culture may become, if not identical, at least harmonious in large degree, and the development of the splendid irrigation projects in the West may be made a subject of congratulation, not only from the viewpoint of the farmer, but from that of the angler as well.

One of the most important functions of the Bureau of Fisheries is to supply fish of suitable species for the stocking of depleted or barren waters, either public or private. Blank forms on which application for fish can be made are furnished on request. These forms call for a brief description of the important features of the waters for which fish are desired, including area and depth, maximum summer temperature, and the species of fish already inhabiting them. When an application properly filled out and indorsed by a Member of Congress is received, a suitable species of fish is assigned thereon, and arrangements are made for the delivery of a consignment at the earliest practicable date. The applicant is notified promptly of the action taken, and as to the approximate time he may expect to receive his fish. Subsequently he receives a second notice as to the exact time the fish will arrive at his railroad station.

Applicants are informed that it is always desirable to apply for species of fish that are indigenous to the region in which the waters are located. The introduction of a foreign species is advisable only after the most careful consideration, as the results that may follow such introduction can not always be foreseen and are sometimes disastrous. In any case the Bureau reserves the right to exercise its judgment in assigning fish on applications. The delivery is made at the railroad station nearest the waters at no expense to the applicant, who is expected to meet the train on which the fish arrive with suitable receptacles in which to receive them. The advance notice of shipment informs him of this requirement and of the necessity of placing the fish in suitable waters as soon as circumstances will permit.

It is also expected that the fish will be given protection—by the restriction or prohibition of fishing—until they have attained the reproductive age, a period of time varying from two to three years, depending on the species and to some extent on local conditions.

Fish are carried in round 10-gallon cans, similar to the cans in general use for the transportation of milk. The number carried per can depends upon their size, the species, the distance they are to be transported, and the season of the year. In general practice it is

customary to carry from 2,000 to 2,500 young fry of the trouts or basses to a can, from 500 to 1,000 1-inch fish, and from 100 to 300 2-inch fish.

For the transportation of the fish the bureau has five railroad cars, which are especially equipped for the carrying of live fish. The newest types of car are of steel construction, of a capacity for carrying 140 cans of fish, and all of them are equipped with mechanical appliances for the aeration of the water. Fish in considerable numbers are also shipped in the baggage cars of regular passenger trains, an attendant accompanying them.

The fish distributed by the bureau are derived from a number of sources. The trouts—brook, rainbow, and black spotted—are produced from eggs purchased from commercial fish-culturists, from brood fish maintained from year to year at the bureau's station, and from wild fish that have been trapped on their natural spawning grounds, stripped of their eggs, and immediately released. Only brook trout eggs are purchased. The eggs of the black-spotted trout are all from wild fish taken from streams in the Yellowstone National Park, and in small numbers in the State of Colorado. The eggs are taken from the fish, fertilized artificially, and incubated on trays or in baskets of wire mesh, which are submerged in troughs supplied with constantly changing water. As they hatch the fry pass through the meshes of the basket or tray to the bottom of the hatching trough, from which they are transferred to other troughs, and later to outside ponds. When they have attained the proper age the young fish are given a food consisting of finely chopped and screened beef liver, beef heart, or a similar product. They are distributed as fry or fingerlings as circumstances appear to warrant. Where the eggs are obtained from wild fish the first consideration in making the distribution is to return a sufficient number of young fish to the home waters to insure a continuance of the supply.

The methods pursued in the culture of the so-called warm-water or pond species—the black basses, sunfishes, crappies, and catfish—are in direct contrast to those employed in trout propagation. None of the pond species responds to artificial treatment at spawning time, thus making it necessary to retain the brood fish in ponds, which are prepared to simulate natural conditions as closely as possible. Here the fish mate, build nests, and deposit and fertilize their eggs, which are closely guarded by the male fish throughout the incubation period, and for as long a time after the young have hatched as they can be kept together. The only interference by man with the spawning habits of these fish is that it is frequently desirable to provide artificially made nests for the spawning ponds, and a screen known as a "fry retainer" is sometimes placed over the nests before the young fish have left them and dispersed themselves

throughout the pond. The object of this screen is to facilitate the capture of the young fish, either for distribution or for their transfer to rearing ponds.

Contrary to the experience in trout work, the young of the pond fishes do not take readily to artificial feeding. This makes it imperative to bring about in the rearing ponds conditions that will permit the development of natural food in sufficient quantities for their sustenance. In this connection the most important requisite is a good growth of aquatic vegetation, of such kinds as enter directly into the dietary of the fish, or that afford suitable breeding places for the multiplication of minute forms of animal life to serve as a food supply.

Because of the difficulties referred to it is not possible to produce fish of the pond species in numbers equal to the trouts, which respond so satisfactorily to artificial manipulation. Thus, whereas a quarter of a million young bass or sunfish would be a very good annual output of an average pond station, a trout station can without difficulty produce several millions of young fish in an equal period of time.

In supplying the warm-water fishes to applicants the bureau is able to augment the stock raised at its stations by the diversion of a small percentage of the immense quantities of young fish that are salvaged every season from temporary pools along the Mississippi River. These pools are formed with the receding of the waters after the floods which annually occur in the spring or early summer months. These quiet back waters afford excellent breeding grounds for many of the river fishes during the high-water stages, but enormous numbers of the young ones are cut off from the main channel as the waters recede, and unless removed from the pools are lost, either by the complete evaporation of the pools or by the freezing of the water during the succeeding winter. Although the numbers of these rescued fishes diverted to the general distribution work are large in the aggregate, they average less than 1 per cent. of the millions that are annually restored to the river.

Every year the bureau furnishes fish in considerable numbers for stocking various waters on Government reservations, on applications submitted by officers of the Reclamation Service, the Forest Service, the State fish and game commissions, and private individuals. The bureau also returns on its own initiative fish in adequate number to maintain the supply in waters from which its egg collections are made. The accompanying table shows plants of fish in Reclamation Service reservoirs during 1918, 1919, and 1920:

Not all the waters involved in the extensive reclamation work are suitable for trout. For the warmer waters of Roosevelt Reservoir and Elephant Butte Reservoir black bass, largemouth bass, rock bass, crappie, sunfish, catfish, buffalo fish, and yellow perch to the number of over 19,000 have been supplied, a

few of them being adults. The species furnished for the other projects mentioned have been the Eastern brook trout, the blackspotted trout, rainbow trout, and lake trout. All of these fish were delivered by means of the bureau's cars at the railroad station nearest the waters for which they were intended, and from there were transported by motor truck or other conveyance by representatives of the different services interested.

Plants of fish in Reclamation Service reservoirs, 1918-1920.

State and project.	Reservoir.	Fish.	
		Species.	Number.
Arizona: Salt River ..	Roosevelt.....	Catfish.....	7,350
		Buffalo fish.....	420
		Crappie.....	3,500
		Yellow perch.....	1,300
Idaho: Boise.....	Arrowrock.....	Large-mouth bass.....	5,700
		Rainbow trout.....	17,000
Do.....	Deer Flat ¹		
		Grayling.....	447,000
Montana: Milk River.	St. Mary Lakes.....	Brook trout.....	278,000
		Black spotted trout.....	112,000
		Rainbow trout.....	22,000
		Brook trout.....	6,700
Do.....	Nelson.....		
		Willow Creek.....	22,000
Montana: Sun River ..	Pishkwn.....		
		do.....	37,000
Nebraska, Wyoming:	Pathfinder.....		
		Rainbow trout.....	103,000
North Platte.	Lahontan.....		
		Rainbow trout....	2,500
Nevada: Newlands...	Avalon ²		
New Mexico: Carlsbad		Black bass.....	250
New Mexico, Texas:	Elephant Butte ³	Rock bass.....	200
		Sunfish.....	600
Rio Grande.	Belle Fourche.....		
South Dakota: Belle	Belle Fourche.....		
Utah: Strawberry	Strawberry.....	Rainbow trout....	58,000
		Brook trout.....	36,800
Valley.	Shoshone ⁴	Black spotted	16,000
		trout.....	
Wyoming: Shoshone.		Rainbow trout....	6,000

- (1) Application on file for attention this season: Catfish.
 (2) Application on file for attention this year: Black bass.
 (3) A considerable number of plants in various tributaries.
 (4) Application on file for attention this year: Trout.

In connection with this subject it may not be amiss to comment briefly on what appears to be a very general belief that fish will thrive and multiply wherever there is a sufficient volume of water. This opinion is entirely erroneous. There are several essential factors governing the successful establishment and maintenance of fish life in a stream or lake, one of the most important being an adequate natural food supply, which in turn is dependent upon suitable water, soil, and climatic conditions. There must also be accessible congenial spawning areas, and places where the young fish may find a refuge from their enemies. If such conditions are not present in any given body of water it will be useless to attempt the establishment of fish life therein. It has been claimed that certain reclamation reservoirs in the deep mountain gorges will not provide a suitable environment for fish, as their precipitous rocky sides cut off all possibility of favorable spawning grounds, and also make prohibitive the conditions necessary for the development of the smaller forms of life to serve as a food supply for the fish.

ECONOMY POINTERS.

As a result of the circular letter sent to the field recently, calling attention to Secretary Fall's desire that effort be made on the part of the employees of the service to exercise every economy in the administration of their work, letters are beginning to be received from our field offices outlining economies effected by them or plans to effect future economies. A few of these are printed below, and it is our intention to publish others from time to time for the benefit of all our projects. No matter how small the economy may seem, let us have a description of it, as the suggestion may lead to considerable saving if applied to all the projects.

Project Manager Burch, of the Orland project, reports that during the month of June his office mimeographed about 700 postal card notices to water users, at an estimated saving, over the cost of printing, of \$4.50.

Project Manager Foster, of the Uncompahgre project, writes as follows:

"Adding machine paper is saved by running two columns on both the front and back sides of the roll.

"It became necessary after the 15,000 applications for water service were printed this spring to have a form for acknowledgment placed on the back of about 8,000 or 9,000 copies. The estimates received for printing these acknowledgments ranged from \$15 to \$20. It was decided to do this work by the project employees in the regular routine of a day's work on the neostyle, and it is believed that the cost of doing the work in this manner did not exceed more than \$1 or \$2.

"An additional 250 preliminary applications for water service were neostyled at a saving of about \$4.

"This office makes it a practice to use all old forms for scratch paper. No scratch paper has been ordered for the project for several years, and it is believed that the saving effected amounts to at least \$2 or \$3 per month."

J. E. Sater, bookkeeper on the Rio Grande project, has drawn up the following list of economy proverbs for use on that project:

ECONOMY PROVERBS.

It takes as much time to throw away a pin as it does to save it.

One side of adding-machine paper is good for use in the adding machine; on the other side may be written memorandums.

Economy in the use of pencils demands that they be used as long and as short as practicable.

Drawing pencils were not made for stenographic work.

Pens, like people, make a better impression if they are kept clean; cleanliness, in turn, prolongs life.

RECLAMATION ABROAD.

Irrigation in the Piave Valley, Italy.

Treviso is to be one of the best irrigated Provinces in Italy upon the completion of a project recently initiated. The project embraces about 130 square miles, the construction of three canals, and the irrigating of the land surrounding 16 townships on the west bank of the Piave. The canals will converge a few hundred yards to the north of Nervesa.—*Commerce Reports*.

Canal to Irrigate Culiacan Valley, Mexico.

Some time ago the authorities of the State of Sinaloa began the construction of an irrigation canal about 50 miles in length to convey water from the Culiacan River over wide areas of rich agricultural lands in the Culiacan River Valley. The work is to be done by small local contractors, who are to be assigned to do the work by sections covered by their respective contracts. A small amount of modern machinery of American manufacture is being sought by the governor of Sinaloa at Culiacan for use in the building of this canal.—*Commerce Reports*.

Irrigation Plan for Central Alberta, Canada.

In order to offset the influence of frequent droughts in central and southern Alberta, a dam is planned to be constructed at a point on the Red Deer River about equidistant from Red Deer and Lacombe. The dam will measure 103 feet from the bottom of the caissons and will require the labor of 500 men for a period of probably five years. A supply of water will be assured by placing a second dam across the North Saskatchewan River, thereby causing water to be backed into the Red River through the Clearwater and tributary streams. A canal will connect the system with Buffalo Lake, thereby causing an increase of 10 feet in its depth, and permitting the use of the lake as a reservoir for the irrigation district embracing the eastern part of Alberta and the western part of Saskatchewan.—*Commerce Reports*.

Irrigation Projects in the Punjab, India.

Opposition to the Sutlej Valley irrigation scheme, which is part of the Punjab Government irrigation projects, has been overcome, and it is now practically certain that this feature of the irrigation plans will receive early attention. The area adopted in the project for the basis of the revenue estimates is over

(Continued on page 381.)

Imagination can be used to advantage when ordering stationery and other office supplies; just think you are ordering groceries.

A bottle of paste is handy to have sticking around, but exposure is dangerous to paste.

5,000,000 acres, and it is probable that this will be largely exceeded. It is stated at a conservative estimate that the annual value of the crops to be raised will be more than double the capital outlay of 145,000,000 rupees. Revenue returns will be much greater than contemplated under the original project because of the sale of some 200,000 acres of Crown waste land which, it is stated, will pay for the capital outlay nearly three times over.—*Commerce Reports*.

BULLETINS FOR THE FARMER.

Distributed by the Department of Agriculture,
Washington, D. C.

FARMERS' BULLETINS.

No.

- 1191. Making American cheese on the farm.
- 1192. Organization of rural community buildings.
- 1195. Rice as food (containing numerous recipes).
- 1197. Protection of mesquite cordwood and posts from borers.
- 1200. Tuberculosis of fowls.
- 1206. The earworm as an enemy of vetch.

DEPARTMENT BULLETINS.

- 916. Freezing injury to potatoes when undercooled.

Distributed by State Experiment Stations.

CIRCULARS, TUCSON, ARIZ.

- 33. Hegari in Arizona.
- 34. Sweet clover in Arizona.

CIRCULARS, MANHATTAN, KANS.

- 88. Lamb feeding investigations, 1919-20.
- 89. Swine feeding investigations, 1919-20.

On many farms in the country the pig is compelled to stand abuses that would exterminate any other animal. Give the pig good clean quarters and good nourishing food.

The fruit that brings the top price is first-class fruit that reaches the market in as good condition as it leaves the orchard and that is packed in a neat and attractive manner.

JUNE WEATHER IN THE WESTERN STATES.

By P. C. Day, United States Weather Bureau.

June weather in the West was mainly warm, yet there were decided fluctuations in the temperature conditions, while the rainfall was less than normal nearly everywhere to westward of the Continental Divide, but generally heavy to eastward. The opening days, save in the more northern and western States, were cool, and in New Mexico and Texas it continued cool for the season for many days; but otherwise the first half of the month was warm, and in the Plateau States there was marked hot weather. About the 15th to 20th abnormally cool weather prevailed, but afterwards it was usually a little warmer than normal, save in Montana and the Dakotas a good deal warmer. The month averaged about 6° warmer than normal over the northern plains, but slightly cooler than normal in most of New Mexico and adjacent districts and in parts of southern California, and elsewhere a little warmer than normal.

The first week brought much rain from Wyoming southward to very near the Mexican border, with decidedly large amounts in parts of Colorado, New Mexico, and Texas. The period from the 13th to 20th included the most widespread rains of the month, considerable amounts falling in extreme northwestern California and thence northward along the immediate coast, also in eastern Montana, northern Wyoming, and western North Dakota.

The last two days of the month brought much additional rain along the north Pacific coast. In all these districts there was nearly everywhere much more than the average June rainfall; indeed, in much of northwestern Texas and southeastern Colorado there was from three to over four times the average June quantity, while in southeastern Montana over twice the average June rainfall was received. In the western parts of Nebraska and South Dakota there was usually a deficiency, and nearly throughout the plateau and Pacific regions the June rainfall was scanty, notably over an area reaching from northern Utah to the border counties of western Montana, northern Idaho, and eastern Washington.

The weather conditions were mainly favorable for outdoor work and in nearly all States for live stock; but in much of Arizona and parts of adjoining States the range was in very poor shape, owing to long-continued scarcity of rain. It was somewhat too dry, and at times too hot, in several districts for good development of small grains, yet on the whole conditions were as good as average, and especially for fall-sown wheat. In the middle plateau region some localities had frost damage about the 17th, yet in almost all districts the weather favored fruit and truck crops.

MONTHLY PROGRESS REPORTS FOR JUNE, 1921.

Monthly conditions of principal Reclamation Service reservoirs for June, 1921.

[Elevation above sea level.]

State and project.	Reservoir.	Available capacity in acre-feet.	Elevation.		Storage in acre-feet.			Out-flow in acre-feet.	Elevation of water surface.		
			Spill-way crest. ¹	Lowest gate sill. ²	Beginning of month.	End of month.	Maximum.		Beginning of month.	End of month.	Maximum.
Arizona, Salt River.....	Roosevelt ³	1,305,000	2128	1903	676,928	576,391	676,928	.....	177.01	167.97	177.01
California, Orland.....	East Park.....	51,000	1199.68	1111.68	51,000	46,650	51,000	3,970	1199.68	1197.28	1199.68
Idaho:											
Boise.....	Arrowrock.....	280,000	3211	2956	280,000	279,000	283,000	716,360	3212.2	3211.8	3213.2
	Deer Flat.....	177,000	2518	2488	177,000	144,471	177,000	52,952	2518	2514.5	2518
Minidoka.....	Lake Wolcott.....	95,181	4245	4236	103,020	106,630	106,630	1,350,200	4245.65	4245.95	4245.95
	Jackson Lake.....	847,000	6769	6730	642,390	847,000	847,000	142,076	6760.75	6769	6769
Montana:											
Milk River.....	Nelson.....	27,000	2214	2200	26,900 ⁴	25,240	26,900	2,930	2212.44	2211.87	2212.44
St. Mary Storage.....	Sherburne.....	66,000	4788	4720	.....	18,000	18,000	.....	4834	4834	4851.6
Sun River.....	Willow Creek.....	16,700	4130	4085	16,222	17,290	17,290	80	4129.5	4130.5	4130.5
Nebraska-Wyoming, North Platte.....	Pathfinder.....	1,070,000	5852	5670	1,085,380	1,126,260	1,179,970	702,345	5853.62	5854.43	5856.63
	Lake Alice.....	11,400	4182	4159	11,074	7,124	11,534	.....	4181.6	4175.9	4182.2
	Lake Minatare.....	60,700	4125	4074	62,506	58,625	65,820	.....	4125.8	4124	4127.3
Nevada, Newlands.....	Lake Tahoe.....	120,000 ⁵	6230	6224	.....	.....	.....	.....	6226.09	6226.67	6226.67
	Lahontan.....	290,000	4162	4060	216,700	265,700	265,700	37,800	4155.8	4161.2	4161.20
New Mexico:											
Carlsbad.....	McMillan.....	45,000	3267.7	3241.6	43,000	45,000	45,000	150,000	3267.4	3667.7	3269.1
Rio Grande.....	Elephant Butte.....	2,638,800	4407	4231.5	1,688,222	2,073,405	2,073,405	124,300	4379.8	4391.8	4391.8
Oregon, Umatilla.....	Cold Spring.....	50,000	621.5	560	48,850	36,800	48,850	12,143	620.74	612.13	620.74
Oregon-California, Klamath.....	Clear Lake.....	462,000	4540	4514	405,000	394,000	405,000	578	4537.86	4537.44	4537.86
South Dakota, Belle Fourche.....	Belle Fourche.....	203,000	2975	2920	175,380	158,380	175,380	29,027	2971.3	2968.9	2971.3
Utah, Strawberry Valley.....	Strawberry.....	291,000	7558	7514	253,600	257,200	261,520	7,444	7558.5	7559	7559.6
Washington:											
Okanogan.....	Conconully.....	14,400	2290	2232	11,227	10,964	12,304	4,955	2283	2283	2285
Yakima.....	Bumping Lake.....	34,000	3426	3389	31,335	38,190	38,945	755	3424.1	3429.3	3429.9
	Lake Cle Elum.....	22,800	2134	2122	30,165	28,640	32,340	3,700	2137.3	2136	2137.5
	Lake Kachess.....	210,000	2258	2192	210,510	219,885	219,885	.....	2257	2257.7	2257.7
	Lake Keechelus.....	152,000	2515	2425	136,310	149,545	149,545	.....	2508.3	2513.7	2513.7
Wyoming, Shoshone.....	Shoshone.....	456,600	5360	5132.3	355,360	474,858	492,152	285,600	5343.5	5362.7	5365.2

¹ Or maximum storage.² Or zero storage.³ Zero water depth at elevation 1902.2.⁴ Amount of silt shown by silt survey deducted from original capacity.⁵ Proposed regulation.⁶ Estimated low-water limit under proposed plan of regulation.⁷ Elevation of reservoir raised 12 inches by stop logs in spillway.⁸ 59-inch flashboards on spillway crest.

SALT RIVER PROJECT, ARIZONA.

Operation and maintenance of irrigation system.—

Water was run continuously in all of the canals during the month, with the exception of the Maricopa Canal, the water being out of this canal for two days for cleaning purposes.

There were five regular maintenance crews in the field. The following statement shows the average number of men and stock employed and the results accomplished: Average number of men, 192; average number of stock, 36; miles main canals cleaned, 86; miles laterals cleaned, 187½; new structures installed, 15; old structures repaired, 125; linear feet stake and brush banks, 2,179; cubic yards dirt fill placed, 965; cubic yards concrete placed, 16; linear feet corrugated pipe placed, 377; linear feet concrete pipe placed, 70; and miles new waste ditches constructed, 3.

In addition to the above crews, one construction crew, with an average of 64 men and 43 head of stock, constructed 6 miles of new waste ditch, placed 773 feet of corrugated pipe and 27 cubic yards of concrete, and built 21 bridges.

The Lilderwood 1½-yard drag line and the Monighan 2-yard drag line were engaged in widening the Eastern Canal, and moved 21,250 cubic yards of dirt.

The Ruth Dredger bermed 8,000 linear feet on the Western Canal, moving 2,100 cubic yards in six working days.

Operation of power system.—The total power generated during the month was 7,656,520 kilowatt hours. The Roosevelt Plant operated continuously, with an output of 5,649,000 kilowatt hours. The Cross Cut Plant also operated continuously, generating 1,005,600 kilowatt hours. The Arizona Falls Plant operated 92 per cent of the month and generated 322,150 kilowatt hours. The South Consolidated Plant operated 99.6 per cent, being shut down at the time of sluicing at Granite Reef. The output of this plant was 489,000 kilowatt hours. The Chandler Plant operated 94.2 per cent of the month, with an output of 170,770 kilowatt hours.

The substations all operated without trouble. Lightning arresters on the North line at Mesa Switching Station and on the Tolleson line at the Phoenix Substation were overhauled.

All pumping plants were available for service as needed.

Construction work.—At Roosevelt the rewinding of generator No. 1 was completed and the generator was installed on Unit No. 5. This completed this work.

The operating floor in the gate chamber of Roosevelt Dam was rebuilt.

Drainage pumping plants.—The installation of the pumps west of Chandler and at 3E 11½N, near Peoria, was finished during the month. The plants were all in operation.—C. C. Cragin.

YUMA PROJECT, ARIZONA-CALIFORNIA.

The peak of the spring flood occurred on the evening of June 27, with a gauge height of 31.2 feet, the highest point reached by the Colorado River since 1878, although Gila River floods have reached higher stages on two occasions. On July 1 a break occurred in the levee, flooding a small area but the damage is not serious.

Construction.—On the East Drain the Bucyrus drag line advanced 900 feet, excavating 11,000 cubic yards of earth. On the South Drain Monaghan drag line No. 2 advanced half a mile, excavating 11,000 cubic yards of earth. Nine wooden structures and two metal flumes were built during the month, principally in connection with the South Drain.

Operation and maintenance.—Fifteen thousand acre-feet of water were delivered to users. On the Indian Reservation Ruth dredge No. 6 cleaned 4.75 miles of laterals, excavating 7,300 cubic yards of silt. In the Yuma Valley, three Ruth dredges cleaned 20.3 miles of laterals, excavating 28,000 cubic yards of silt. The P. & H. drag line was occupied in cleaning the Main Drain; 4,800 cubic yards of material were excavated in this work. Thirty-two thousand cubic yards of riprap were placed on the levees.

The maximum discharge of the Colorado River was 186,000 second-feet; minimum 61,000 second-feet. On June 30 the gauge was 27.6 feet, with a discharge of 144,000 second-feet. Total discharge for the month was 6,609,000 acre-feet.

Official visitors were Mr. Youngman, of the San Francisco office of the P. & H Co., Mr. Herbert V. Clotts, Supervising Engineer, U. S. Indian Office, Mr. C. H. Ruth, and Mr. G. W. Corrigan, Division Engineer of the Southern Pacific Co.—*Porter J. Preston.*

MESA DIVISION, PART 1.

June weather was favorable for construction work. The crushing plant at the mesa quarry was operated part time. The rock crushed was used in surfacing roads and for concrete work at the B Lift Pumping Plant. Construction of the B Lift Pumping Plant was carried on with a force of about 15 men. At the end of the month the building was practically completed up to and including the motor floor. The building for the manufacture of concrete pipe was being erected and was practically completed.

The 30-B Bucyrus dragline worked between stations 260 and 279, raising the bank of the East Main Canal, and between stations 13 and 32 of the supply canal; 20,400 cubic yards were moved. Extensive repairs were made on this machine from the 3d to the 10th, the repairs being made on the floating clutch disk and rear flywheel.

Office engineering was confined to routine work on construction now being carried on, and the checking of structure designs submitted by the Denver office. Efficient labor was scarce.—*Porter J. Preston.*

ORLAND PROJECT, CALIFORNIA.

June temperatures were moderate, except for two periods of several days each. Light showers totaling 0.16 inch of precipitation occurred on the 15th and the 29th. The remainder of the second crop of alfalfa was harvested, yielding a good tonnage. The planting of milo continued throughout the entire month. The natural flow of Stony Creek diminished to a point where it was necessary on the 13th to begin draft on storage at East Park Reservoir in order to supply project irrigation requirements. Four thousand acre-feet of water were released from storage, and 7,400

acre-feet delivered to 14,000 acres which were irrigated.

A force of four men and one team was engaged in surfacing operating roads, mowing weeds and water grass, and preparing grasshopper poison, 1 ton of which was mixed and sold to water users. Infestation by grasshoppers was not so severe as in former years, and a comprehensive campaign of poisoning during the present season would eliminate the possibility of a serious infestation next year. A small amount of gravel was delivered for use on concrete lining to be placed in the fall.—*R. C. E. Weber.*

GRAND VALLEY PROJECT, COLORADO.

June weather during the first half was cooler than normal, but the last part of the month was hot and dry. Conditions were favorable for all outside work as well as for the growth of crops. Labor was plentiful.

The first cutting of alfalfa was nearly all harvested, producing a satisfactory yield of excellent quality. Winter wheat was ready to harvest at the end of the month and promised a good yield. Sugar beets made an excellent growth and were in first-class condition. Crops in general over the project were above average.

The irrigation system was in continuous operation, furnishing water for 20,000 acres of land in the project and the Palisade and Mesa County Irrigation Districts. No difficulties of note were experienced and water deliveries were made without interruption, except for a few minor delays due to small breaks in laterals. Maintenance work was confined to routine repairs on the lateral system. Seventeen minor wooden structures were installed during the month, and a section of Lateral No. 41 was reconstructed by the small P. & H. drag line, which work involved 1,400 cubic yards of excavation. The Grand River reached a stage of 50,800 second-feet on the 16th, equaling the highest mark on record. No damage resulted to the irrigation works of the project.

Drainage construction was continued, with three drag-line excavators working on the project and one in the Grand Valley Drainage District. One and six-tenths miles of drain were completed, involving 32,500 cubic yards of excavation. The output of all machines was reduced by time lost on account of moving and repairs.—*S. O. Harper.*

UNCOMPAHGRE PROJECT, COLORADO.

June weather was somewhat below normal during the early part of the month. The crop situation at the end of the month was about normal, both in stand and growth.

The cherry harvest was in full swing. The first cutting of alfalfa was practically made at the end of the month and the yield appears to be a little above normal.

The flow of the Uncompahgre River was sufficient to supply the demand for all irrigation water, except for a few days. All project canals and laterals were carried at maximum capacity.

The Uncompahgre River reached flood stage on the 10th. This stage gradually increased until the 15th, at which time about 4,500 second-feet were coming in at the upper end of the valley, an amount approximately twice as great as that recorded during any previously known flood. Much damage was done to the railroad, bottom-land ranches, county roads and bridges, and private ditches. The project canal sys-

tem suffered to some extent. The damage wrought only necessitated the shutting off of the irrigation flow in the Homerun Canal and the West Canal for a period of 7 and 10 days, respectively.—*L. J. Foster.*

BOISE PROJECT, IDAHO.

June weather was favorable for the growth of irrigated crops. The month was warm and extremely dry.

Labor conditions.—A number of unemployed men were given work in the harvest fields, but there was a surplus at all times. There was no change in the wage scale.

Farming operations.—The farmers were busy irrigating, cultivating, and harvesting the first cutting of alfalfa. All crops were in excellent condition. Apple buyers began contracting for fall delivery at good prices. The indications were that there would be a large potato acreage ready to harvest in July, but the price was unstable.

Water supply.—The run-off from Boise River drainage basin was about 60 per cent above normal. During the first part of the month the river was discharging about 15,000 second-feet. This increased to 19,000 second-feet by the 12th, and gradually receded to 7,000 second-feet at the end of the month.

Operation and maintenance.—The entire canal system was operated to its capacity and the demand for water was heavy. On the upper end of the Main Canal some trouble was experienced with sand, which was brought down the river by the extremely high water. The hot weather caused a rapid growth of moss and weeds, and a number of men were required in keeping the canals clean. On the Notus Division the canal was in operation throughout the entire month, and no serious difficulty was encountered. The Austin dragline was under operation cleaning drains in the Fargo basin.

Construction.—The only construction work in progress was the placing of minor structures on the Notus Division.

Drainage.—The 1-yard dragline excavator continued work in the Fargo basin. One field party was engaged in making drainage investigations in the Arena basin and on the Wilder bench.

Surveys.—One field party was engaged during a portion of the month in staking out farm laterals under the Notus Division. Lines and grades were given for the construction and drainage work in progress.—*J. B. Bond.*

KING HILL PROJECT, IDAHO.

June weather was favorable for outside work.

Operation and maintenance.—Delivery of water by Government forces was uninterrupted in the main canal. Water was turned out of Lateral 4 for six hours to permit repairs to a wooden siphon. At the end of the month all farms were well irrigated.

Construction.—The sealing pool on the Siphon Spillway from the Idaho Power Co.'s flume was started and completed during the month. The P. & H. 206 dragline started digging on the Slick flume bench on the 14th, and the last 10 days of the month was working two shifts per day.

Field and office engineering.—One field party was employed on location of structures and experimental investigations. In addition to the routine work, the office engineer was engaged in checking up ownership of lands in connection with King Hill Irrigation District contract.

Camp 12, from which the Cold Springs flume will be built, was erected and work on the construction

plant was well under way. It was expected that construction on this job would start July 10.—*E. C. Panton.*

MINIDOKA PROJECT, IDAHO.

June weather was generally favorable for crops, although the average temperature was rather low. The demand for water for irrigation was low during the first part of the month, owing to the heavy spring rains, but gradually increased until in the last week the normal maximum capacity was reached and thereafter maintained until the end of the month.

Regular operation and maintenance on both the Gravity and Pumping Divisions was carried on. On the evening of the 13th a break occurred in the Main South Side Canal in Section 21, Township 9 South, Range 25 East, which caused a slight interruption to service on the Pumping Division. The break was about 30 feet wide and 7 feet deep. By the afternoon of the 14th the break was repaired and a full head of water was again running. On July 27, the B4 Canal on the Gravity Division broke at a point about 2 miles from the head of the canal. The break was repaired by the Minidoka Irrigation District and the canal was again in service the next day. In both cases the breaks were caused by gophers or ground squirrels.

The transmission line from Burley to Milner, for transmitting power from the Idaho Power Co., was completed. The Miller substation on this line was also completed. Both the line and the substation were tested on the 29th and found to be ready for use. Beginning July 1 power will be obtained over this line and the lines of the Idaho Power Co. from the Boise River plant to supplement the supply generated at the Minidoka Dam. The transformers and practically all other equipment for the addition to the Burley substation were installed.

At the Minidoka power house all generators were in operation as required. The total amount of power generated was 4,494,490 kilowatt hours, whereas in June, 1920, it was 5,579,300 kilowatt hours. There were 8 interruptions to service during the month, aggregating 29 minutes, all of them being due to minor causes.

The Boise River plant was operated throughout the month, only two units, however, being in service. The third one was undergoing repairs.

At American Falls the work of clearing the new town site of sagebrush was completed. Plans for the new town were being prepared by Town Planner Russell V. Black. Two parties were engaged in making a detailed topographic survey of the town site, and covered 322 acres, leaving 280 acres yet to be taken.

Gaging stations were established on the streams flowing into the reservoir basin and readings taken at these stations every two weeks. Readings were also secured of ground-water elevations at the subwells that have been established.

One appraiser of rural property completed the appraisal of 103 farms, having an area of 10,922 acres, making a total of 252 farms appraised to date, containing 31,831 acres. There were 23 purchases of right of way during the month for the sum of \$71,856. The total number of purchases to date is 69, the total paid being \$202,721.11.

Three parties were engaged in a topographic survey of the North Side Pumping Division and covered 4,410 acres, making the total area surveyed to date 142,778 acres. On the Acequia Extension and the adjacent area 55 miles of levels were run, making a total of 546 miles of level control established.

One hundred and two cars of farm products were shipped, which included 18 cars of alfalfa, 16 of wheat, 26 of flour and bran, 1 of sugar, 11 of potatoes, and 30 of live stock.

Crop conditions on the project continued excellent. A hailstorm on the 23d did some damage to crops in the southwest part of the project.

Snake River reached its maximum discharge on the 3d, with a flow of 32,692 second-feet at Howell's Ferry. At the end of the month the discharge had dropped to 6,654 second-feet. The total amount of water passing Howell's Ferry during the month was 1,350,182 acre-feet. Jackson Lake was filled to its capacity of 847,000 acre-feet on the 19th. The total discharge for the month past the Jackson Lake Dam was 138,846 acre-feet.—Barry Dibble.

Prevailing crop prices at close of June, 1921.

Project.	Alfalfa hay, per ton.		Barley, per bushel.	Oats, per bushel.	Wheat, per bushel.	Potatoes, per bushel.
	In stack.	Baled at shipping point.				
Salt River.....	\$6-\$9	\$10-\$13	\$0.55	\$0.45	\$1.26	\$1.50
Yuma.....	8.00	11.50	.40		1.56	
Orland.....	7.00	10.00	.50		.99	
Grand Valley.....	8.00	10.00		.60	1.40	1.75
Uncompahgre.....	5-8		1-1.25	.40-.50	1-1.10	.70
Boise.....	5.00	9.00	.40	.50	1.00	1.10
King Hill.....	6.00			.46		.75
Minidoka.....	7.00	10.00	.75	.40	.90	.60
Huntley.....						
Milk River.....	8.00	10-11	.84	.56	1.08	3.60
Sun River.....	7.00	10.00	.70	.75	1.14	.45
Lower Yellowstone.....	10.00		.75	.65	1.13	.60
North Platte.....	5.00					
Newlands.....	4.00	8.00				
Carlsbad.....		7-10				
Rio Grande.....		16-18				
North Dakota pump- ing.....	15.00	18.00		.43	1.15	1.00
Umatilla.....		10.00				
Klamath.....	11.00	18.00	.60	.40	1.18	
Belle Fourche.....	6.00		.85	.42	1.05	3.50
Strawberry Valley.....		12.50	.73	.60	.66	2.10
Okanogan.....	18.00					1.00
Yakima:						
Sunnyside unit.....		9-12				
Tieton unit.....		9-12				
Riverton.....						
Shoshone.....						
Indian projects:						
Blackfeet.....	10.00		.20	.15	1.05	.60
Flathead.....	10.00	15.00		.54	.90-1.10	
Fort Peck.....			.26	.17	1.12	1.80

HUNTLEY PROJECT, MONTANA.

June weather was favorable for all prevailing work and crop growth. Timely rains put off irrigation until the latter part of the month, at which time the canal was operated to its ultimate capacity and the auxiliary pumping plant was in operation for five days.

Operation and maintenance was confined to routine work, repairing small breaks in laterals, cleaning grass and weeds from ditches, and work incidental to the delivery of water. The Austin drag line completed cleaning the main canal above McCaffrey check, and was en route to lateral G, which will be lowered in order to take water during the peak of the irrigation season from lateral F G L. A break occurred in the Main Canal extension at Mill Creek on the morning of June 29, and water was out of the canal for 36 hours.

The general crop condition was satisfactory, although the first cutting of alfalfa was light, owing to the hailstorm on the 31st. The winter and fall dryland crops were still in good condition, although rains were badly needed.—A. R. McGinness.

Project weather during June, 1921.

Project.	Station.	Temperature, ° F.			Precipitation (inches).
		Maximum.	Minimum.	Mean.	
Salt River.....	Phoenix, Ariz.....	110	54	84.8	0.04
Yuma.....	Yuma, Ariz.....	109	58	84.4	T.
Orland.....	Orland, Calif.....	108	49	75.8	0.16
Grand Valley.....	Grand Junction, Colo.....	98	42	72	0.63
Uncompahgre.....	Montrose, Colo.....	97	41	66.8	1.50
Boise.....	Boise, Idaho.....	94	43	68.2	0.09
King Hill.....	Glenns Ferry, Idaho.....				
Minidoka.....	Burley, Idaho.....	92	33	64.2	1.60
Huntley.....	Ballantine, Mont.....	95	38	67.8	2.59
Milk River.....	Malta, Mont.....	91	39	67.9	4.29
St. Mary storage.....	Near Babb, Mont.....	85	23	58	1.65
Sun River.....	Fort Shaw, Mont.....	91	41	63.7	1.39
Lower Yellowstone.....	Savage, Mont.....	99	45	66	2.72
North Platte.....	Wyncote, Wyo.....	97	42	66.0	2.28
Newlands.....	Fallon, Nev.....	97	36		0.66
Carlsbad.....	Carlsbad, N. Mex.....	98	54	74.8	2.81
Rio Grande.....	El Paso, Tex.....	101	56	79.6	.79
North Dakota pump- ing.....	Williston, N. Dak.....	95	44	69	5.68
Umatilla.....	Hermiston, Oreg.....	100	45	69.8	0.57
Klamath.....	Klamath Falls, Oreg.....	91	36	62.5	0.48
Belle Fourche.....	Orman, S. Dak.....	102	46	72.7	2.41
Strawberry Valley.....	Provo, Utah.....	96	39	66.2	0.31
Okanogan.....	Omak, Wash.....	97	40	68.4	0.21
Yakima:					
Sunnyside.....	Sunnyside, Wash.....	98	40	69	0.52
Tieton.....	Cowiche, Wash.....	89	38	63.7	0.27
Riverton.....	Diversion Dam, Wyo.....	93	38	63.3	1.56
Shoshone.....	Powell, Wyo.....	97	41	67.3	.45
Indian projects:					
Blackfeet.....	Browning, Mont.....	78	26	52.5	1.64
Flathead.....	St. Ignatius, Mont.....	91	36	62.5	2.38
Fort Peck.....	Poplar, Mont.....	100	44	70.9	7.33

MILK RIVER PROJECT, MONTANA.

June weather was favorable for construction during the first half of the month, but during the latter half excess rains considerably delayed operations. The precipitation of 4.29 inches was 1.23 inches above normal. The mean temperature was about 4 degrees above normal. After the 13th rain fell at some time each day for all of the remainder of the month, except seven days. Hail did some damage on the 16th, but the area affected was not large. Excessive rains on the Glasgow Division caused two breaks in the Vandalia Canal. All crops were in excellent condition. The first cutting of alfalfa was about 60 per cent harvested, but the showery weather seriously interfered with this work, and some of the hay was damaged after being cut. The labor supply was plentiful.

Surveys.—Farm unit and lateral extension surveys were continued both under the Nelson Reservoir and Vandalia Canals. Preparations were being made to start at least three parties on topographic surveys in the near future. Work was in progress on a series of test wells covering the greater portion of the Beaver Creek Flats. Drainage investigations were continued.

Construction by contract.—The contractor for the enlargement of Nelson Reservoir moved on to the work and was making good progress. Six small earthwork contractors were engaged during the month on lateral extensions. One structure contractor continued work. Two additional small earthwork contracts and one

structure contract were awarded. These include the extension of Lateral B-48 to deliver water to the Great Northern Railway Co. at Bowdoin.

Construction by Government forces.—Sixteen miles of operation and maintenance road were completed on the Nelson Reservoir Canal. The concrete siphon to carry the NS-116-2-10 across Beaver Creek, about 5 miles west of Hinsdale, was nearly completed. About 40 small wooden structures, comprising turnouts, checks, measuring devices, etc., were placed at various points on the project. The preservative treatment of lumber was continued.

Operation and maintenance.—Cleaning the Dodson North Canal by drag line was continued and excellent progress made, about 1 mile being cleaned. A second P. & H. drag line was put in operation cleaning waste water ditch NW-1-3, which is to dispose of surplus water on the Beaver Creek Flats, resulting from seepage from Nelson Reservoir. Dry paving was placed at structures at several places on the project. A break occurred in a flume on the Vandalia Canal at Vandalia Point, caused by settlement of the piers, and temporary repairs were made at this point. About 1,500 square yards of brush paving were placed on the south river bank at Vandalia Point as a protective measure against cutting. Other miscellaneous small repair jobs were continued. Water deliveries were heavy during the first half of the month, but after the heavy rains these practically all fell off. At the end of the month the Dodson North was the only canal in operation, and this for a small amount only. One hundred and forty-eight rental applications were received during the month, making a total of 238 to date. Two hundred and fifty-five water deliveries, amounting to 3,230 acre-feet, were made during the month. The water supply in Milk River was augmented by a continuous flow of about 400 second-feet at the mouth of the St. Mary Canal. This was re-

duced to about 300 second-feet at the end of the month. It is probable that the natural flow satisfied the demands for irrigation in the Chinook Division, so that nearly all water used on the Malta and Glasgow Divisions was supplemental water from the St. Mary Storage.—*H. A. Parker.*

ST. MARY STORAGE DIVISION.

June weather was favorable for work being carried on. There was considerable precipitation, but it was principally in heavy showers which did not interfere greatly with the work in progress. The showers and the warm weather kept the flow in the St. Mary River up to or above normal.

The St. Mary Canal was operated during the entire month; a total of 24,186 acre-feet was diverted from St. Mary River and a total of 20,245 acre-feet delivered to the North Fork of Milk River. Sherburne Lakes Reservoir gates were closed on the 20th, and 18,000 acre-feet were stored at the end of the month.

A crew, consisting of an average of 16 men and 5 teams, was employed at Sherburne Lakes Dam straightening the concrete retaining wall in the lower end of the spillway channel, which had failed owing to the north hillside slide, completing the paving on the face of the dam, and placing rock at the lower end of the outlet conduit. Nearly all of the work proposed at Sherburne Lakes Dam was completed at the end of the month. A crew consisting of 11 men and 5 teams was employed in rebuilding 1,130 linear feet of canal banks to prevent excessive seepage. The Bucyrus drag line moved 5,716 cubic yards of slide material from the canal section.

Other work consisted of strengthening canal banks where slides occurred and placing riprap at the outlet of the five drops at the lower end of the canal.—*R. M. Snell.*

Crop report, irrigated farms, Milk River project, Montana (exclusive of Chinook Division), 1920.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	4,031	Ton.....	7,516	1.9	\$12.00	\$90,190	\$22.37
Alfalfa seed.....	35	Bushel.....	65	2.9	24.00	1,572	69.40
Barley.....	89	do.....	1,302	14.6	.45	586	6.60
Cane.....	19	Ton.....	75	3.2	12.00	900	38.52
Corn, flint.....	63	Bushel.....	1,552	24.6	1.00	1,550	24.60
Corn fodder.....	104	Ton.....	390	3.7	10.00	3,900	37.50
Flax.....	575	Bushel.....	2,655	4.6	2.10	5,580	9.70
Garden.....	15					3,730	248.67
Hay ¹	13,315	Ton.....	8,807	.7	16.00	140,910	10.56
Oats.....	1,058	Bushel.....	23,758	22.4	.75	17,820	16.80
Pasture.....	35					205	5.85
Potatoes.....	88	Bushel.....	12,339	140	1.50	18,510	210.30
Rye.....	85	do.....	820	9.6	1.10	903	10.60
Sedan grass.....	192	Ton.....	60	.3	8.00	480	2.50
Wheat.....	2,799	Bushel.....	26,227			45,364	
Less duplicated areas.....	173						
Total cropped.....	* 22,330	Total and average.....				332,200	14.90

	Areas.	Acres.	Farms.	Per cent of project.	
Young alfalfa.....	2,000	Irrigable area farms reported.....	37,420	230	36
Total irrigated.....	24,330	Irrigated area farms reported.....	18,000	* 230	18
		Cropped area farms reported.....	22,332	230	22

¹ Native Blue Joint hay 95 per cent. Grain hay 5 per cent.

* This report includes 18,000 acres irrigated from Government canals and 6,330 irrigated from creek floods.

² 152 farms more than 50 per cent irrigated; 78 farms less than 50 per cent irrigated.

SUN RIVER PROJECT, MONTANA.

June weather was warm, with occasional light rains. The heaviest rain occurred about the middle of month and amounted to about three-fourths of an inch. The precipitation was not enough for unirrigated crops, and these were badly burned in a good many localities.

Construction work consisted of manufacture of concrete pipe and construction of operation road along Sun River Slope Canal by Government forces, and of excavation of laterals on Beale Division by contract. The structures contractor began hauling materials and excavating for structures.

Irrigation was general on the project, and about 9,000 acres on the Greenfields Division and 7,000 acres on the Fort Shaw Division were irrigated. A maximum of 230 second-feet was diverted into the Fort Shaw Canal; the maximum quantity taken out of Pishkun Reservoir was 464 second-feet, and of this 300 second-feet were delivered at Fairfield drop in Greenfields Canal, which is at the head of the irrigable land.

The removal of silt from the Greenfields laterals was finished early in the month. Minor repairs were made to canals, laterals, and structures on both divisions. Telephone lines 1 and 3 were repaired.

Farm work consisted of ditching, irrigating, planting potatoes, and harvesting first crop of alfalfa. Grain crops properly irrigated were in good condition; some of the grain on Greenfields Bench was irrigated too late for best results. The potato crop was backward. Carload shipments from the project consisted of 9 cars of wheat, 1 of flax, and 1 of hay.—Geo. O. Sanford.

LOWER YELLOWSTONE PROJECT, MONTANA-NORTH DAKOTA.

The first 18 days of June were very dry, and the precipitation for the entire month was 2.72 inches, or 0.35 inch less than the average since 1906. The last 10 days of the month were very warm, and on the 29th the temperature was 99 degrees. There were 17 clear days and 13 cloudy or partly cloudy days.

Irrigation started with a rush on the 1st of the month, and during the month 13,300 acres were irrigated, principally wheat and alfalfa. All water deliveries were made promptly, although it was necessary, for a few days, to follow strictly the rotation schedule.

All crops in the valley were in excellent condition, as a whole, and the prospects for a good crop were never better.

The operating force was busy the entire month, and the following is a summary of what was accomplished: Turnouts installed, 56; banks raised and laterals cleaned (teams), 31,390 linear feet; concrete checks installed, 2; wooden flume installed, 1; pipe culvert installed, 1; and miscellaneous repairs, 23.

The Ruth lateral cleaner started on the 25th on lateral KK, and in five and one-half days removed the silt from this lateral on one side over a reach of 7,900 feet, moving 2,330 cubic yards of material. From progress made with this machine during the short time used, it is evident that lateral cleaning with teams from now on will be a small expense.

At the end of the month the maintenance crew was materially reduced, and the distributary system was in shape to make all water deliveries for the remainder of the season.

The water in the Yellowstone River overflowed its banks on the 21st and 22d of the month and flooded

Crop report, dry-farmed units, Milk River project, Montana (exclusive of Chinook Division), 1920.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	862	Ton.....	945	1.1	\$12.00	\$11,340	\$13.20
Alfalfa seed.....	20	Bushel.....	90	4.5	24.00	2,160	108.00
Barley.....	49	do.....	450	9.2	.45	202	4.14
Beans.....	1	do.....	10	10	7.00	70	70.00
Cane.....	8	Ton.....	35	4.4	12.00	420	52.50
Corn, flint.....	312	Bushel.....	2,960	9.5	1.00	2,960	9.50
Corn fodder.....	129	Ton.....	244	1.9	10.00	2,440	18.90
Flax.....	743	Bushel.....	1,060	1.4	2.10	2,226	3.00
Garden.....	4	.....	.....	.....	.....	700	175.00
Hay ¹	1,521	Ton.....	1,000	.7	16.00	16,000	10.50
Millet seed.....	105	Bushel.....	50	.5	6.00	300	2.86
Oats.....	613	do.....	8,002	13	.75	6,002	9.78
Pasture.....	5,280	.....	.....	.....	.....	23,785	4.50
Potatoes.....	29	Bushel.....	2,615	90	1.50	3,923	135.25
Rye.....	80	do.....	112	1.4	1.10	123	1.54
Sedan grass.....	60	Ton.....	35	.6	8.00	280	4.67
Wheat.....	2,959	Bushel.....	16,919	5.7	1.75	29,609	10.00
Less duplicated areas.....	15	.....	.....	.....	.....	.....	.....
Total cropped (dry farmed).....	12,760 ²	Total and average.....	.....	.....	.....	102,540	8.05

Areas.	Acres.	Farms.	Per cent of project.
Total irrigable area farms reported.....	45,271	287	44
Total cropped area farms reported (dry farmed).....	12,764	.....	12

¹ Native blue joint hay 94% Grain hay 6%.

² 57 farms dry farmed, balance of area is included in farms partially irrigated.

small tracts of lowlands; however no great amount of damage was done.

The main canal was at normal elevation through long reaches, owing to checking during a greater part of the month, and because of prompt action on the part of the maintenance force during the unusually heavy rains on the lower end of the project on the 18th in turning the water out at the various sluice gates the damage caused by the banks overflowing was very slight. In the vicinity of Hay Creeks the rainfall was in the nature of a cloudburst, and the highway bridges were put out of commission. No other damage resulted.—*L. H. Mitchell.*

NORTH PLATTE PROJECT, NEBRASKA-WYOMING.

June weather for the fore part of the month was generally cloudy and rainy, with several storms which did considerable damage in some localities. The rains helped the crops to a considerable extent but retarded progress on construction. The latter part of the month was fair and warm, the temperature rising to 98 degrees on the 30th.

Operation.—The gates at Pathfinder Reservoir remained closed the entire month, the overflowing from the spillway being sufficient to satisfy the requirements for irrigation. The overflow from the spillway averaged 11,824 second-feet, the total amount to 702,345 acre-feet.

The diversion into the Interstate Canal was decreased from 800 second-feet on the 1st to 350 second-feet on the 8th, and then increased to 1,050 second-feet on the 16th, at which time a break occurred at Mile 9.9, requiring 25,000 cubic yards of material to repair the break. The gates were opened on the 22d, and the diversion increased to 1,575 second-feet at the end of the month. Rains and no demand for water were the causes of the decrease the fore part of the month. All storage reservoirs were full.

Deliveries from the Fort Laramie Canal continued throughout the month, but the demand did not require more than 676 second-feet to be diverted at the headworks.

Deliveries were commenced on the Northport Division on the 23d, the demand not amounting to more than 18 second-feet.

The maintenance work on both divisions was confined to routine maintenance and replacement work. On the Interstate Division drag line No. 122230 continued work on the Interstate Canal banks, moving 16,418 cubic yards of material, or 415 cubic yards per shift.

Crops.—No old crops were disposed of during the month. The new crops were looking excellent, but it was feared that some of the young alfalfa was lost during the hot weather the latter part of the month, no water being available on account of the break in the Interstate Canal. About 90 per cent of the first cutting of alfalfa was harvested and stacked, and an excellent crop was obtained. The harvest of the winter wheat and rye was begun early in July. Potato bugs necessitated the spraying of the potato crop, but the beet worms had not affected the beet crop. On the whole, the stand of the crops appears better than the average.

Drainage.—Drag line No. 122229 replaced drag line No. 122221 on the Minatare Drain. Excavation progressed until the 16th, at which time the machine was shipped to Fort Laramie to assist in the repair of the Interstate Canal break near that point. During the seven shifts operated the machine moved 2,160 cubic yards of material, or an average of 307 cubic yards per shift.

Drag line No. 121157 continued work on the Dutch Flats area, operating three shifts daily and making good progress until the 17th, at which time it was shipped to Fort Laramie to assist in the repair of the Interstate Canal break near that point; 12,517 cubic yards of material were moved on drainage areas during the month by this machine, or an average of 348 cubic yards per shift.

A contract was let for the back fill of the tile line in the Upper Sheep Creek area and one for the construction of three drainage pump houses in the Dutch Flats area.

On the Fort Laramie Division electric drag line No. 131313 completed the excavation of Branch D on Cherry Creek Drain and commenced digging on Branch B of the same drain. This machine lost nine shifts on account of repairs and spent two days in moving. During the month 30,222 cubic yards of material were excavated, or an average of 582 cubic yards per shift.

Construction.—Storage division: Work continued on the excavation for the valve house for the North Tunnel Outlets. Two shifts were worked daily. The total excavation for the month amounted to 850 cubic yards of class 3 material. No concrete was placed during the month.

Fort Laramie Division: Three of the electric drag lines were at work on the Fort Laramie Canal in Wyoming, each being operated two shifts daily. The total yardage moved during the month was 122,620 cubic yards, completing 1.39 miles of canal.

Drag line No. 121150 was used near the Lingle Power Plant to load brule clay into wagons, for use in road construction on the banks of the Fort Laramie Canal; also in loading gravel in wagons for use in concreting wasteway at Mile 255 on the canal. Toward the end of the month it was used in cleaning a drain ditch on the canal above the power plant.

The powder crew drilled 3,667 linear feet of holes and used 6,800 pounds of T. N. T. in blasting classified material on the Fort Laramie Canal.

Good progress was made on the construction of canal and lateral structures by Government forces. Work continued on the structures in Upper Cherry Creek Valley. A large number of contracts were let for earthwork, gravel hauling, and the construction of structures. The work was being let in small amounts, in order that local contractors and farmers might secure work. The prices bid generally were very low.

Northport Division: The excavation of the Northport Canal was continued by the electric drag line, the Bucyrus Class 14 machine, and the elevating grader outfit constructing fills ahead of the drag lines. Good progress was made by the construction forces on the canal and lateral structures. Several earthwork, gravel hauling, and structure contracts were in force, and preparations were made to advertise more work in the near future.

Power system.—The Lingle Power Plant was operated continuously, with three shifts daily. In addition to the power used for construction purposes, 2,400 kilowatt-hours were delivered to Lingle, Wyo.; 32,600 kilowatt-hours, to Torrington, Wyo.; 6,700 kilowatt-hours to Morrill, Nebr.; and 27,700 kilowatt-hours to Mitchell, Nebr.

Surveys.—The field parties were all busy on lines and grades for construction work by Government forces and contract, and in the preparation of new work for advertisement.—*H. C. Stetson.*

NEWLANDS PROJECT, NEVADA.

June weather was pleasant and favorable for crops. Some light showers visited the project, which, aside-

from causing a little inconvenience in haying operations were very beneficial to young alfalfa seeding and road conditions.

Farming operations.—Crops made a satisfactory growth during June, especially sugar beets, grain, and cantaloupes, which were in a most promising growing condition. The first cutting of alfalfa was practically all cut and about one-half in the stack by the end of the month. Labor for haying was plentiful, the wages paid being \$2 to \$2.50 per day and board for forkers and \$3 per day for stackers. The marketing outlook for alfalfa hay was discouraging, the only offers being around \$4 per ton in stack. The newly organized farmers' cooperative creamery located at Fallon, which is a subsidiary of the old Churchill Creamery (Inc.), started operating on the 1st and reported a very satisfactory business. The price of butter fat, which ranged from 30 to 36 cents per pound, was very encouraging to those farmers having dairy cows, as their alfalfa hay could be made to bring about \$25 per ton at these prices by feeding it to good-grade dairy stock.

Water supply.—Lahontan Reservoir rose 5.40 feet, which was equivalent to a gain of 49,000 acre-feet storage. The elevation of water surface of 4,161.20 feet in this reservoir at end of month was the highest on record and was only 0.80 foot below crest of spillway weirs. The storage of 265,700 acre-feet, corresponding to their elevation, is far in excess of irrigation requirements this season, and should insure the operation of Lahontan power plant, through the auxiliary power take-out from the reservoir, during the period of low water in Truckee River, unless unforeseen conditions arise. The water surface in Lake Tahoe rose 0.58 foot during June, which brought the elevation to 6,226.67 feet.

Operation and maintenance.—The operation of the distributing system was uninterrupted, except for a few minor breaks in the laterals and shutting out the water from a few ditches for two or three days in order to kill moss which had begun to interrupt the flow of water. The use of water was particularly heavy during the fore part of the month, as nearly everyone was irrigating just before haying. During this period a maximum draft of 1,000 second-feet was recorded from Lahontan Reservoir, which is the highest discharge for irrigation purposes on record. Truckee Canal was operated with a diversion of about 600 second-feet at head for irrigation, storage, and operation of Lahontan power plant. The maximum discharge of V canal, which serves the South Carson division, was 846 second-feet, and that of T canal, serving North Carson division, was 224 second-feet, both of which diversions were the maximum on record.

The regular maintenance crew was engaged principally on the eradication of moss and vegetation from the ditch system and repairing such breaks as occurred. Two miles of laterals were cleared of drift sand in the Soda Lake district; vegetation was mowed from about 6 miles of laterals, and about 16 miles were cleared of moss in the South Carson system. Some 18 minor wooden lateral structures were repaired or replaced, in addition to repairs to one large concrete drop on the S line canal. Two ditch houses were refloored and minor repairs made on several others.

Construction.—Bids were opened on the 16th for the construction of Lisle lateral in the Fernley district, involving 1,895 cubic yards of earthwork. Contract for construction of this lateral was awarded to J. A. Wood, whose bid was 15 cents per cubic yard.

About 500 cubic yards of dirt were moved by Government forces in repairing road along west side of the J lateral, filling in borrow pit made by contractor in the construction of this lateral.

The C2 lateral in the Sheckler district was reconstructed between station 11+20 and station 20+75, in order to serve the unit recently homesteaded by Paul Condee. A short spillway was also constructed in F4 lateral in the Harmon district. The following wooden structures were installed in the lateral system: Four turnouts, 1 two-foot drop, 1 check, 2 wasteways, and 1 short flume, 27 feet in length.

One of the two 2-yard Bucyrus drag-line excavators for use on the proposed deep drainage system was received during the latter part of the month and was being unloaded and erected at the project yards.

Settlement.—No homestead entries were made in June, nor water rights taken out on private land. Lands on the plats open to entry included 16 homesteads, totaling 1,741 acres of irrigable land and 6 tracts of private land, embracing 1,111 acres for which water rights were available.

Carson Lake pasture.—The Government range rider reported 1,203 head of stock in the pasture, consisting of 867 head of cattle and 336 head of horses and mules. Grazing was excellent and stock in good condition.

Miscellaneous.—On June 1 Federal Judge Van Fleet dismissed the action brought by certain Lake Tahoe property owners for collection of damages from the United States for alleged damage to property due to the regulation of the lake by the Service during 1916.

On June 5 the project manager attended a meeting at Fernley, Nev., held by committees from the Reno and Fallon Chambers of Commerce and water users for discussion of plans for project development to utilize Truckee River waters. Gov. E. D. Boyle was in attendance.

On June 6 the board of directors for the irrigation district met for consideration of the question of payment of the operation and maintenance deficit. The board canvassed the vote polled to determine whether the water users were in favor of paying the deficit or whether the matter should be carried to court for decision. Out of about 200 votes cast, approximately 140 were in favor of instituting legal proceedings.

District Judge C. J. McFadden rendered an opinion on June 25 confirming the organization of the irrigation district and upholding the assessment of drainage benefits.—*John F. Richardson.*

CARLSBAD PROJECT, NEW MEXICO.

June weather was cloudy, and there was considerable precipitation until the 25th; a period of fair weather lasted from that time until the close of the month. The last few days of the month were extremely warm and sultry. The minimum flow of the Pecos River of 600 acre-feet occurred on June 1. The maximum flow of 34,000 acre-feet occurred on June 6. High water continued throughout the month, aggregating a total run-off of 160,000 acre-feet.

Maintenance work consisted of the completion of the cleaning of E drain in the Otis district and weed cutting in the lateral system. The drag-line machine was moved from D drain in the Loving district to E drain the 1st of the month. The cleaning work on the E drain was completed about the 15th. Two thousand five hundred linear feet on the lower part of E drain were cleaned with the machine. Silt was taken from the bottom of the drain to an average depth of 2½ feet, and the rest of the drain was cleaned by hand

of an overgrowth of salt cedars, cat-tails, and moss. Owing to the large amount of rain and warm weather, the laterals rapidly became overgrown with weeds and Johnson grass. One large crew was working during the latter half of the month and two small crews all month cleaning laterals. The east bank of the Main Canal at the crossing on the Cass Draw drainage was badly eroded for a distance of about 1,000 feet; however, it is probable no work will be necessary for the repair of this until the end of the season. About 100 linear feet of Black River concrete ditch were broken and cracked by flood waters during a heavy storm which occurred on the 21st. Repairs will be postponed until the end of the season.

Rains during most of the month delayed cutting of the first crop of alfalfa hay and resulted in considerable damage to that crop. In addition to this, hay growers found it increasingly hard to market their crop, owing to the large quantity of off-grade hay and the general condition of the hay market. At the close of the month there existed an almost complete stagnation in the hay market. The cotton crop generally was in fair condition, the average stands being very good. The crop as a whole, however, was a little later than usual. On the 21st a heavy hailstorm occurred in the district from the Pecos River to within a short distance of the town of Loving. About 1,000 acres of cotton were completely stripped of leaves and the main stalks badly beaten. The crop on the above area was entirely ruined. In addition to this, five or six hundred acres of cotton and corn were badly damaged.—*L. E. Foster.*

RIO GRANDE PROJECT, NEW MEXICO-TEXAS.

June weather was about normal, with a highest temperature of 101° and a rainfall of 0.79 inch, which did little damage to crops. Hailstorms caused some damage.

The inflow into the reservoir at San Marcial for the month was 653,402 acre-feet, as compared with 191,451 acre-feet for May and 1,002,816 acre-feet for June, 1920, a month during which one of the heaviest floods in the history of the Rio Grande occurred. The flow of this June reached a peak of 19,360 second-feet, inundating the town of San Marcial and raising the reservoir to within 4.2 feet of the spillway gate collars. The rise was caused by rain and melting snow and was followed by a sharp drop.

At Elephant Butte the appearance of the grounds and buildings is being improved as circumstances allow. The reservoir is being taken advantage of by pleasure seekers and sportsmen more and more as facilities for transportation and accommodations are being developed. The greatest outflow from the reservoir was 2,500 second-feet, discharged as a precautionary measure at the peak of the flood. The normal discharge was 2,000 second-feet. Thirty-four thousand and thirteen acre-feet were delivered to 56,071 acres by 5,273 deliveries. Water service was good during the month. Cuts, necessitated by breaks, sluicing, or construction, where made were either short or adequately prepared for by arrangement of the irrigation schedule. Measurement of water is being applied more satisfactorily as equipment is being supplied.

Riprap, back fill, weed cutting, and raising of dangerous canal banks, and installation of tap boxes and checks were accomplished by contract, maintenance crews, and ditch riders. Three hundred yards of sand washed into the Rodey Lateral by floods were removed by teams, and a drag line removed 8,484 yards of sand washed into the West Side Drain by floods.

A rise in the river caused by floods in the Rincon and Palomas Valleys flooded lands below El Paso and on the island, but caused no damage.

Crops have been better than at first expected. Hail and rain did some damage during the month. Wheat and hay were being harvested. Frost and hail during the year have injured truck and fruit to such an extent as to render it unprofitable for one canning association to operate. Cooperative buying and selling, organizations formed and forming, are fast progressing.

At Elephant Butte construction of the embankment paving, consisting of 21,800 square yards, with an average thickness of 6 inches of reinforced concrete, was completed on June 16. Excavation continued on the spillway channel, and concreting was begun. Construction work consisted principally of drag-line excavator operation and construction of pertinent structures. In the Rincon Valley the Monighan 1T excavator continued on the Garfield Drain. In the Mesilla Valley three drag lines continued drainage construction and a small P. & H. machine operated on the lateral construction. In the El Paso Valley two Bucyrus machines continued on drainage construction, the Bucyrus 30-B on canal construction and a small P. & H. on lateral construction. Under contract the Jennings Construction & Engineering Co. excavated 25,800 cubic yards from the Tornillo Drain.—*L. R. Fiock.*

Summary of employees for June, 1921.

Projects.	Beginning of month.	End of month.	Increase.	Decrease.
Washington office.....	88	87	.....	1
Denver office.....	87	87	.....	.....
Field legal.....	25	25	.....	.....
Examiners of accounts.....	3	3	.....	.....
Yuma.....	235	297	62	.....
Yuma auxiliary.....	.....	.....	.....	.....
Orland.....	25	24	.....	1
Grand Valley.....	83	82	.....	1
Uncompahgre.....	68	86	18	.....
Boise.....	278	227	.....	51
King Hill.....	64	100	36	.....
Minidoka.....	163	158	.....	5
Huntley.....	37	34	.....	3
Lower Yellowstone.....	58	56	.....	2
Milk River.....	123	120	.....	3
St. Mary Storage (including one-half time of eight employees on Blackfoot).....	44	43	.....	1
Sun River.....	95	64	.....	31
North Platte.....	582	520	.....	62
Newlands.....	60	59	.....	1
Carlsbad.....	27	34	7	.....
Rio Grande.....	470	581	111	.....
North Dakota pumping.....	50	50	.....	.....
Klamath.....	183	202	19	.....
Umatilla.....	55	50	.....	5
Belle Fourche.....	95	77	.....	18
Strawberry Valley.....	56	29	.....	27
Okanogan.....	101	102	1	.....
Yakima.....	123	127	4	.....
Tieton Dam.....	310	324	14	.....
Riverton.....	58	58	.....	.....
Shoshone.....	296	241	.....	55
Blackfoot (exclusive of one-half time of eight employees on St. Mary storage).....	20	15	.....	5
Flathead.....	178	140	.....	38
Fort Peck.....	27	40	13	.....
Unassigned per diem.....	34	33	.....	1
Total employees.....	4,201	4,175	.....	.....
Increase.....	.....	.....	285	.....
Decrease.....	.....	.....	.....	311
Net decrease.....	.....	.....	.....	26

NORTH DAKOTA PUMPING PROJECT.

June weather was favorable for all farm work. The striking feature for the month was the amount of precipitation, which exceeded any month but one in the records of 40 years. The total precipitation for the month was 5.68 inches, which was 2.11 inches above normal, and made an accumulated excess for the year of 2.38 inches.

The Missouri River rose 12.75 feet, reaching its record stage on the 17th of 20.75 feet. During the flood the river apparently changed its channel in the Williston bend, where the intake station is located, and shifted to its old channel. For several years the old channel has been filling and threatened to shut off the intake station. The extent of the change can not be known until the water has receded to normal stage.

Following the rains which occasioned this high water demand for irrigation water ceased and no further water was delivered. It was anticipated that there would be no further irrigation until July 5, when the first cutting of alfalfa will be stacked and out of the way. The outlook was that the grain crops would be carried through to harvest without irrigation. The irrigation season opened very slowly, and during the period of service, June 4 to 16, 612 acres were irrigated.

Seventy-four thousand four hundred and fifty kilowatt-hours of energy were delivered to the city of Williston, which was 950 kilowatt-hours less than for the same month last year.

One thousand two hundred and forty-five tons of coal were mined.—Wm. S. Arthur.

UMATILLA PROJECT, OREGON.

June weather was normal, except for a low mean temperature.

Farming operations.—The first cutting of alfalfa was harvested. It was quite foul with cheat and in places was light. At the close of the month the second crop was irrigated once and in some cases twice. Forty-two cars of hay, 1½ tons of honey, and over 6,000 pounds of wool were shipped.

Labor conditions.—Labor conditions were easy in view of the amount of work in progress.

Operation and maintenance.—The feed canal was operated for storage until the 8th, and water was delivered to the Echo Mills throughout the month. From 27 to 107 second-feet were diverted, of which from 27 to 33 second-feet were delivered to the Echo Mills and from 1 to 98 second-feet to Cold Springs Reservoir. At the close of the month the available storage in Cold Springs Reservoir was 36,800 acre-feet. From 167 to 253 second-feet were diverted by Canal A continuously and from 35 to 90 second-feet by the Maxwell Canal. From 140 to 150 second-feet were diverted continuously from the reservoir by the West Extension Main Canal. The demand for water on the East Side was very heavy, a total of 15,600 second-feet being diverted to the system. The demand for water on the West Side was comparatively light.

General maintenance on the East and West Divisions was carried on by from two to four small crews, the principal work being the combating of moss and weeds.

Construction.—West Side Division: Seven hundred and twenty-eight linear feet of 12-inch concrete pipe were laid and four turnouts installed on laterals 6 and 6a; 898 linear feet of 12-inch and 15-inch concrete pipe were laid, 150 linear feet of concrete lining

were placed, and one outlet basin constructed on lateral 12; 798 linear feet of 12-inch concrete pipe were laid and three turnouts installed on lateral 11a; 645 linear feet of 12-inch and 15-inch concrete pipe were laid and one turnout installed on lateral 10.

On the East Side Division 1,402 linear feet of 20-inch and 286 linear feet of 16-inch concrete pipe were laid and four minor structures installed in supplemental construction district No. 36; 858 linear feet of 20-inch pipe were laid, 1,900 linear feet of lateral were concrete lined, and three turnouts were installed on supplemental construction district No. 35; 888 linear feet of small lateral, involving the excavation of 260 cubic yards of class 1 material, were built on supplemental construction district No. 37. One metal flume of 69 linear feet was constructed on district No. 22. Pipe was manufactured as follows: Nine hundred 12-inch, one hundred and forty 16-inch, six hundred and fifty-seven 20-inch, and six turnouts.—Maurice D. Scroggs.

KLAMATH PROJECT, OREGON-CALIFORNIA.

June weather was favorable for practically all farm crops. Precipitation occurred on five days, the total for the month amounting to 0.48 inch. Slight frosts occurred at scattered places and some damage was done to gardens.

Water deliveries for May were unusually light. The demand for water during June was much heavier, and from the 8th to the 30th all of the smaller canals were being operated at maximum capacity. During the month 16,000 acre-feet of water were delivered to the farms. The cutting of the first crop of alfalfa was begun during the last week in June.

One survey party was engaged in field work in connection with the precast flume job on the C canal and on miscellaneous surveys for operation and maintenance work. One survey party was engaged in making preliminary and final location surveys for the J canal and lateral system.

Four repair crews, consisting of a foreman and from four to six laborers each, were engaged all month in general repairs to the distributing and drainage system.

Good progress was made on the precast flume job. During the month 332 flume sections, 4 feet 3 inches in length, 118 bents, and 119 sets of stringers were cast. The concrete placed during the month amounted to 900 cubic yards, and the total placed to date to 1,465 cubic yards. A crew of about 80 men was employed on the flume job. The precast units were being cast at the side of the present timber flume. The precasting job will be completed prior to the end of the irrigation season. The timber structure will then be dismantled and the new structure erected.

The Bucyrus excavator No. 121473 was engaged in the construction of the C-G canal, excavating 35,821 cubic yards of material, about 20 per cent of which was Class No. 2. The Monihan excavator No. 122235 began the construction of the J canal on the 20th, excavating 7,780 cubic yards. The machine will construct the lower bank with material excavated from the canal section; the upper bank will be constructed with material excavated from the parallel waste ditch. Bucyrus excavator No. 121248 was engaged all month in enlarging the 5-H drain, the material excavated amounting to 13,008 cubic yards, about 15 per cent of which was Class No. 2.

During the month the California-Oregon Power Co. employed a crew of about 60 men on the construction of the Link River Dam. The west abutment and the gate section above the Keno Canal have been com-

pleted. Excavation amounted to about 1,500 cubic yards and the concrete placed to 350 cubic yards.

The contract with W. D. Miller for the construction of the Diversion Dam on Lower Lost River was approved by the department, and Mr. Miller expects to begin operations in the near future.—*Herbert D. Newell.*

BELLE FOURCHE PROJECT, SOUTH DAKOTA.

June weather was satisfactory for irrigation farming, although the continued high temperatures were not for the best interests of grain crop. Showers were frequent during the first week and heavy rains occurred on the 18th and 27th. Alfalfa made rapid growth and harvesting of the first cutting began on the 15th. Exceptionally fine hay weather prevailed for one week, beginning the 20th. With temperatures around 95° the harvest made good progress, and about 75 per cent of the first alfalfa cutting was put up without damage by rains. Corn stood about 12 inches high and had excellent prospects. Dry land crop suffered somewhat as a result of the scorching hot weather, but in general the outlook was satisfactory and above the average.

Irrigation was in progress throughout the month and the demand for water reached a maximum on the 18th when the North Canal flowed 600 second-feet. The extremely hot weather of the second week required the immediate irrigation of grain crops, and limited areas were scorched before the fields could be covered. All orders for water were filled as requested, except for a few days on the lower end of the North Canal. The situation was becoming somewhat tense when the rain of the 18th relieved the demand on the canal system.

A break that carried away 40 feet of the lower bank occurred on the South Canal at Mile 11 during the early hours of the 20th. Repairs were made imme-

diately, and water was again turned in this section of canal on the evening of the 22d. About 860 yards of earth were moved in repairing the break.

The drag-line excavator completed the cleaning of the Newell Drain on the 27th, and then moved 7½ miles to the Wilson Lateral Cut. This machine cleaned 4,600 linear feet and moved 6,905 yards of muck. The grade of the drain was lowered about 2 feet.

Miscellaneous cleaning on small laterals was in progress and repairs and replacement of structures were continued. Two concrete chutes, the Butte Hall and Richards Lateral, were completed, a 400-foot wooden chute was constructed to serve as a wasteway at the end of the Antelope Lateral, and 8 lateral drops, 24 farm turnouts, and 15 miscellaneous small structures were completed.

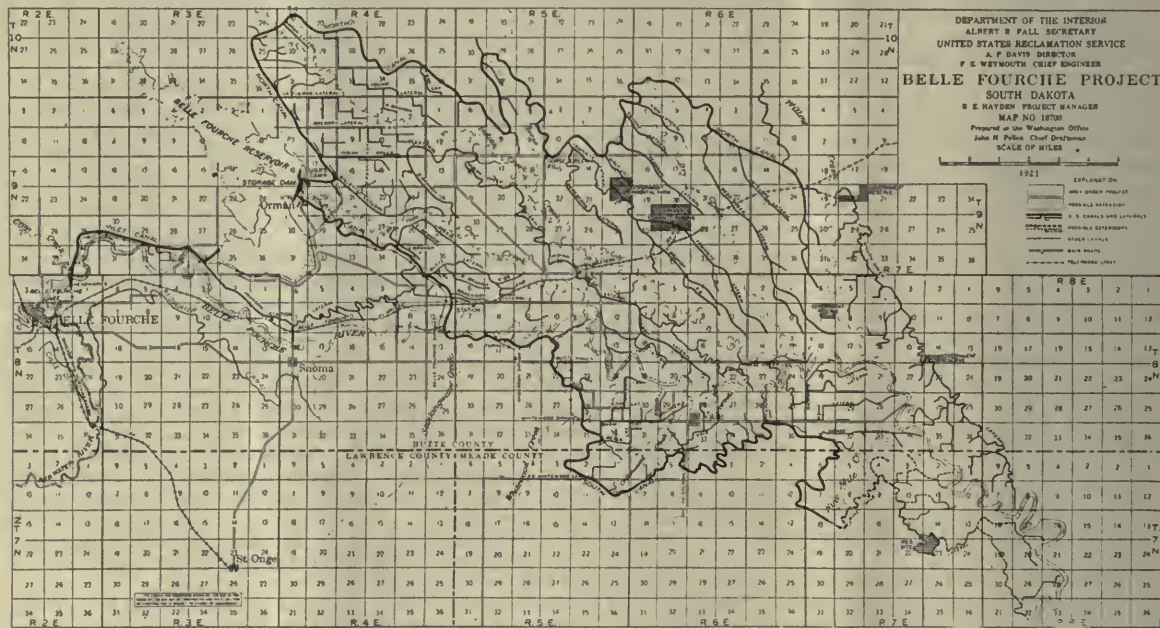
Excavation work on the Willow Creek Extension, which began May 27, made fair progress. The six subcontractors had a force of 22 men and 39 teams, and moved 17,000 yards of earth. This represents about 9 per cent of the total work covered by contract No. 853, awarded to Threet Bros., of Lovell, Wyo., at 23 cents per yard. The material was heavy gumbo and shale.—*F. C. Youngblutt.*

STRAWBERRY VALLEY PROJECT, UTAH.

June weather was generally fair and warm, with practically no precipitation.

Water supply.—Strawberry Reservoir was filled on May 27, and from that date to June 17 water was discharged over the spillway at Strawberry Dam, with a maximum depth of 1.6 feet on the 15th. The gates at East Portal of Strawberry Tunnel were opened on the 16th, when 150 second-feet of water were turned out for irrigation purposes.

Farming operations.—The unusually dry and warm weather materially assisted the growth of all crops and increased the demand for irrigation water. The



Copies of this map, in four colors, size 10 by 16 inches, price 10 cents, may be obtained from the Director United States Reclamation Service, Washington, D. C.

first crop of alfalfa was harvested, with excellent yield reported. The cherry and strawberry crops were about picked, with fair prices prevailing. The condition of the sugar beets was excellent, with all indications of a big yield. Fall wheat was in excellent condition, and harvesting should begin early in July.

Hydrographic data.—The High Line Canal on the last day of the month was carrying 232 second-feet, and a total of 10,753 acre-feet were delivered to the High Line Division for irrigation purposes. On the last day of the month the flow of water in the Spanish Fork River was about 190 second-feet, so that the demand for water from Strawberry Reservoir by the Spanish Fork Division was very little. Altogether 7,444 acre-feet of water were delivered from Strawberry Reservoir, 6,375 acre-feet to the High Line Division, 627 acre-feet to the Spanish Fork Division, and 442 acre-feet to the Mapleton and Springville Irrigation Districts. The total amount of irrigation water delivered to the several divisions of the project from all sources was approximately 22,500 acre-feet, of which amount 1,500 acre-feet were from the Spanish Fork River.

Labor.—All classes of labor continued plentiful, and no trouble was experienced in obtaining an ample supply whenever required.

Operation and maintenance, storage system.—All usual patrol work was done by the regular forces in connection with the storage features. The work on repairs to Strawberry Tunnel continued to the 15th, when camp was closed down and the forces disbanded until the end of the irrigation season.

Operation and maintenance, power system.—The Power Plant was operated without interruption, and

power furnished to the towns of Spanish Fork, Payson, Salem, and Springville.

Repairs to the exciter unit No. 1 were completed during the month.

The Power Canal embankment was raised at three different places to insure the safe delivery of the maximum demand of water.

The telephone line between the Power Plant and East Portal was inspected and cleared of brush.

Settlement.—Five new water-right applications were received and accepted.

General.—Supplemental contract, between the United States and Strawberry High Line Canal Co., relative to waste, seepage, and return waters, was approved by the Director under date of June 14.

Landowners under the proposed Santaquin Irrigation District voted June 20 on the formation of an irrigation district. Returns show 1,900 acre-feet in favor of the formation of the district and 200 acre-feet against.—W. L. Whittemore.

OKANOGAN PROJECT, WASHINGTON.

June weather was generally cool, with many cloudy days and threatening rain. The Robinson Flat Substation and the pumping plant were operated continuously, with small power interruptions. The master mechanic and one helper were employed in moving the second pumping plant in Riverside and making some repairs to the Robinson Flat Pumping Plant, the major portion of the time being spent in moving and setting up the generator in its old location at Power Plant No. 2. The rest of the project operation and maintenance force were employed continuously in

Comparison between operation and maintenance estimates and results, Jan. 1 to June 30, 1921.

Project.	Gross cost.				Accruals.				Area that can be irrigated, 1921.
	Estimate for 1921.		Actual cost to June 30.	Amount *over or under	Estimate for 1921.		Actual returns to June 30.	Amount more or *less than estimate.	
	Total for year.	To June 30.			Total for year.	To June 30.			
Belle Fourche.....	\$120,000	\$69,500	\$62,000	\$7,500	\$148,000	\$53,200	\$20,000	*\$33,200	Acres.
Boise.....	345,000	168,400	201,000	*32,600	321,500	174,000	129,000	*45,900	82,800
Carlsbad.....	50,000	29,800	32,100	*2,300	52,000	27,500	27,500	0	165,800
Grand Valley.....	60,000	29,000	33,000	*4,000	61,400	22,000	24,500	2,500	25,000
Huntley.....	75,000	38,800	38,800	0	88,600	29,500	11,500	*17,000	38,350
King Hill.....	129,000				29,000				31,300
Klamath.....	75,000	44,000	45,800	*1,800	87,900	35,500	39,500	4,000	16,000
Lower Yellowstone.....	66,000	34,000	34,000	0	66,000				52,500
Milk River.....	90,000	33,300	30,500	2,800	45,000	24,200	7,500	*16,800	38,700
Minidoka.....	134,000	64,100	57,700	6,400	134,000	46,200	30,000	*16,200	2 74,500
Newlands.....	118,700	73,000	76,300	*3,300	120,600	57,600	58,800	1,200	49,000
North Dakota, pumping.....	58,600	27,400	24,000	3,400	26,800	9,000	9,000	0	69,300
North Platte—Interstate.....	275,000	143,000	166,500	*23,500	342,800	89,000	45,000	*44,000	3 7,650
North Platte—Fort Laramie.....	63,000	31,200	25,400	5,800	24,000	4,500	4,500	0	129,900
Okanogan.....	35,000	17,500	22,500	*5,000	41,700	27,000	33,000	6,000	14,000
Orland.....	35,000	14,300	19,700	*5,400	41,200	20,700	20,700	0	8,000
Rio Grande ¹	242,500				249,000				20,500
Shoshone.....	108,600	56,800	50,000	6,800	126,000	43,400	43,400	0	118,000
Strawberry Valley.....	87,500	59,400	66,100	*6,700	60,300	21,000	7,000	*14,000	65,800
Sun River—Fort Shaw.....	20,000	12,000	13,400	*1,400	26,400	10,300	8,800	*1,500	59,100
Sun River—Green Fields.....	25,000	13,500	18,200	*4,700	10,000	11,300	7,500	*3,800	12,200
Umatilla.....	53,000	30,000	29,400	600	53,000	25,700	26,500	800	25,100
Uncompahgre ¹	145,000				152,300				26,300
Yakima—Sunnyside.....	135,000	69,900	75,400	*5,500	150,500	75,400	75,400	0	100,000
Yakima—Tieton.....	92,000	46,000	49,000	*3,000	103,200	44,000	41,400	*2,600	110,800
Yuma.....	233,000	140,000	136,000	4,000	300,000	150,000	136,000	*14,000	32,000
Total.....	\$2,770,900	1,244,900	1,306,800	*61,900	2,861,200	1,000,100	806,500	*193,600	1,433,900

¹ Report not received from project in time for publication.

² Stored water is furnished through St. Mary Canal for 21,600 acres additional.

³ Includes 17,000 acres for which water is carried in main canal.

⁴ Total estimated net cost is \$2,691,118.

the operation and maintenance of the project distribution system and the general routine office work.—
Calvin Casteel.

Reclamation fund transactions.

[Taken from Washington office books for the period June 1 to 30, 1921.]

PRELIMINARY.

Balance of fund from May report.....	\$1,150,096.30
Potash royalties and rentals.....	2,627.76
Net sales of public land (April).....	59,486.07
Deposits by fiscal agents (C/D's).....	295,136.29
Collections by the auditor.....	94,109.17
Total accretions.....	1,601,455.59
Withdrawals:	
Funds advanced to fiscal agents.....	\$31,000.00
Disbursements by auditor.....	135,637.99
Total withdrawals.....	966,637.99
Balance.....	634,817.60
Land sales, May, 1921, available in July.....	157,925.46
Oil leasing receipts deposited but not covered in by Treasury.....	1,507,678.59
Balances with fiscal agents.....	502,613.78
Estimated land sales, June, 1921.....	150,000.00
Proceeds town-site sales not covered in by Treasury.....	6,167.37
Adjustment 1920 land sales not covered in by Treasury.....	208,921.97
Royalty oil, furnished Shipping Board, not covered in by Treasury.....	283,799.97
Estimated total funds.....	3,451,924.74

The above does not include June proceeds from the oil leasing act amounting to approximately \$800,000.

Balance of funds appearing on the books of the Treasury as at June 30, 1921.

Reclamation fund.....	\$300,000.00
Yuma auxiliary fund.....	242,000.00
Blackfeet:	
1919.....	6,981.87
1920.....	2,016.98
1921.....	1,402.80
Flathead.....	123,304.67
Fort Peck:	
1919.....	27,770.32
1920.....	2,359.26
1921.....	604.74
Riverton:	
1919.....	1,043.90
1920.....	190.64
1921.....	

YAKIMA PROJECT, WASHINGTON.

The prevailing temperature was about normal, with precipitation greater than recorded for June during last five years, with the exception of June, 1916.

Operation and maintenance, Sunnyside division.—The average diversion from the river for the month was about 1,200 second-feet, of which 50 to 60 second-feet were wasted, in order to furnish sufficient power water for the operation of the Outlook pumping plant at the head of Snipes Canal. The maximum diversion was 1,240 second-feet, at the close of the month. Operation was continuous and without unusual incident, except on June 4 and 5, when the water was turned out of the main canal at Sulphur Creek and Zillah wasteways to permit search to be made for the body of Henry Cartner, a boy 9 years old, who was drowned in the canal near Mile 44 on June 2. The body was recovered on the 5th about 6 p. m. The pumping plants supplying the various irrigation districts were operated, with short interruptions for cleaning and repairs. Operation of the Grandview and Prosser plants was also interrupted on account of the turning off of the water on June 4 and 5, as mentioned above.

Tieton division.—An average diversion of 315 second-feet from Tieton River was maintained until noon on the 29th, when a break occurred in the concrete-

lined section of the main canal about one-fourth mile above the intake of Tieton Tunnel, caused by a large rock rolling down the hillside and crashing through the 4-inch side walls, making an opening about 5 feet long. The rock was removed and the canal section repaired in time for full run of water by noon of the 30th. An average of 11 second-feet was diverted from the South Fork of Cowiche Creek, and this diversion aided greatly in the regulation of the laterals and permitted the supplying of extra water and off-schedule deliveries where needed. Minor interruptions in water deliveries, owing to failure of small concrete pipe lines, were confined principally to Unit 1.

Maintenance work on the Sunnyside and Tieton divisions consisted mainly of repair and replacement of small structures in the distribution systems and cleaning of weeds and moss from laterals and branch canals.

Storage diversion.—The reservoir gates at Keechelus and Kachess were operated to control the lake rise. The gates at Bumping Lake were open all the month. Twenty-inch flashboards were placed on the spillway crest. At Cle Elum water was passing over the spillway throughout the month.

New divisions.—A field crew of 11 men worked all month on surveys for the Roza Division, taking topography and completing main canal location. Final report on the Moxee Division was forwarded to the chief engineer for approval.—*J. L. Lytel.*

TIETON DAM.

Construction work on the Tieton Dam during June consisted of stripping the dam site, excavation for concrete core wall, and excavation of lower portal cut for diversion tunnel. The water in the Tieton River remained high throughout the month, so that it was impossible to drive the tunnel from the upper end. Good progress was made on core-wall excavation, so that at the end of the month enough trench was opened on suitable rock foundation for beginning the placing of concrete. A concrete plant and sand and gravel washing plant were being constructed. Work was continued on stripping the dam site with a small team crew. Rock from the lower tunnel portal cut was placed in the dam. Work continued on power plant No. 2, and at the end of the month the machinery and flume were in place, with a representative of the Trump Co. on the ground ready to install the machinery. The sawmill operated all month, but closed down for the season at the end of the month.

D. C. Henny visited the project on the 29th. Labor was plentiful. There was much cold and windy weather, which was otherwise favorable for construction work.—*F. T. Crowe.*

RIVERTON PROJECT, WYOMING.

June weather was on the whole favorable for construction. The temperature was about 3° higher than normal. The total precipitation was about 1½ inches, most of which fell on the 5th and 6th. The roads were in bad condition throughout the greater part of the month, but were worked over during the latter part of the month and were rapidly improving.

Drag line No. 121322 completed the excavation on the side hill on the 25th and then moved up on the bench to about mile 6 and began working down the canal. Except for some repairs, this machine was operated two shifts throughout the month.

Drag line No. 121323 was working up the canal, building the upper bank. This machine crossed Dry Creek on the 11th. The traction machinery was over-

hauled and repairs to frame were necessary during the month.

Drag line No. 121474 was operated two shifts throughout the month excavating loam from the earth section. This machine crossed Dry Creek on the 29th.

The total amount of material excavated by the three machines was 102,519 cubic yards, of which 101,849 cubic yards were excavated from the canal prism. Of this material 88,209 cubic yards were class 1 material, a rather heavy loam, and 14,310 cubic yards were sandstone.

The adjourned hearing on the organization of the proposed Midvale irrigation district was held at Lander on June 1. No opposition to the organization developed and the district was declared organized by the court.—*H. D. Comstock.*

SHOSHONE PROJECT, WYOMING.

June was a pleasant, sunshiny month, with warm but not excessively hot temperatures.

Water supply.—The Shoshone River was at flood stage the entire month. The Shoshone Reservoir began spilling on the night of the 9th, and on the 13th the maximum discharge occurred, with a depth of 5.2 feet over the spillway and an estimated discharge of 11,000 second-feet. Since that date the river discharge continued between 3,000 and 4,000 second-feet.

Operation and maintenance.—The principal work during the month was on the operation of the canal

system. From the 6th to the 23d the demand for water was exceedingly heavy, and the main canal was running at practically full capacity. Twenty-four thousand three hundred acre-feet were delivered to the farms for the irrigation of about 45,000 acres of land. The maximum rate of diversion was 970 second-feet, the minimum 200 second-feet, and the total diversion was 40,500 acre-feet. The P. & H. dragline continued on the Frannie Canal, cleaning from the 1st to the 13th. The other items of maintenance work were mainly repairs to minor structures, cleaning of weeds from some of the sublaterals, inspecting open and closed drains, repairing one break in closed drain A4, and repairing several washouts in the banks of lateral D-23, occasioned by local showers.

Crops.—All of the crops were looking exceptionally good and were about 10 days advanced over the usual state. The first cutting of alfalfa was more than half completed. Some farmers in the Frannie division started this work on the 15th. The advance crop report indicated a total of 46,150 acres in crop this season, of which 35,500 acres were in the Garland division, the balance being in the Frannie division. The following shipments were made during the month: 1 car of wheat, 2 of cattle, and 1 of hogs.

Labor.—The labor situation continued satisfactory throughout the month.

Drainage.—The following tabulation shows the progress on drainage excavation during the month:

Machine.	Number.	Area.	Drain.	Linear feet.	Cubic yards.	Dates commenced and completed work, inclusive.
Bucyrus.....	121324	North Garland.....	28.....	2,150	7,399	June 1-9.
			28-280.....	2,675	15,580	June 10-30.
Do.....	11128	Frannie division P-1.....	103-2.....	1,410	12,343	June 1-13.
			108.....	1,900	10,612	June 14-30.
Do.....	121472	North Garland.....	28-292.....	880	4,854	June 1-3.
			28-230.....	3,041	25,884	June 4-11.
			28-30-48.....	2,560	14,338	June 12-30.
Do.....	121475	Frannie, part 1.....	104.....	729	6,901	June 1-4.
			104-80.....	1,575	5,662	June 5-13.
			106.....	5,165	32,464	June 14-30.
Monighan.....	12426	West Garland.....	72.....	475	3,235	June 1-2.
			Z-51.....	363	1,040	June 3-6.
Lidgerwood.....	113210	South Garland.....	X-65.....	3,730	22,007	June 1-30.
P. & H.....	121161	O. and M. Garland.....	Deepening Frannie Canal.....	2,278	3,418	June 1-13.
		North Garland.....	28-230.....		2,077	June 14-30.
Do.....	121153	Frannie, part 1.....	103-2.....	12,675	5,000	June 1-30.
			H.....	1,000	850	June 6-11.
Austin trench.....	42112	West Garland.....	Z-21.....	375	295	June 28-30.
Total.....				28,028	173,989	

¹ Recont.

The Monighan dragline was engaged after the 21st on excavating a sedimentation basin near the Ralston Reservoir for the town of Powell water supply.

Field and office engineering.—Field work was carried on by two crews each, on the Garland and Frannie Divisions, and one crew for part of the month at Shoshone Dam. One crew on the Frannie division was engaged on topographic surveys and the other on miscellaneous surveys connected with drainage construction. One crew on the Garland division was engaged principally on drainage construction, and the other on trial lines in connection with the Polecat Bench extension of the Heart Mountain Canal. The crew at Shoshone Dam began work on the final location of the transmission line to Powell.

Construction.—Construction work on the Garland and Frannie divisions was confined practically to

minor structures connected with the drainage system. Fourteen minor timber structures, involving about 10,000 feet board measure, were erected on the waste-way near the end of lateral D-56, a part 1, Frannie Division, construction feature. At the Shoshone power plant it was necessary to discontinue work on the night of the 9th because of the flood stage of the river. Most of the equipment was moved from the river bottom at that time. On the 21st the work of constructing cofferdams and replacing the equipment in the river bottom was undertaken. Before it was necessary to remove equipment the excavation for the power-house site was practically completed. The flood did little damage to the hole, although it was filled with water. The trimming of the power tunnel was practically completed, and work on the drainage system was under way. Seven linear feet of the by-pass

tunnel were excavated before the flood stopped work. The crusher plant was operated for a sufficient period to manufacture 400 cubic yards of concrete materials, which fill all the storage space available for that purpose.—*J. S. Longwell.*

INDIAN PROJECTS, MONTANA.

BLACKFEET PROJECT.

June weather was favorable for construction, operation, and maintenance work and crop growth. Several showers helped materially in keeping the crops growing and preventing loss on lands that had not been irrigated.

The four systems under the project were operated. A total of 6,521 acre-feet was delivered to farms, and 8,141 acres were irrigated. The Two Medicine and Badger-Fisher systems were operated to capacity the latter part of the month, all of the water necessary being delivered on the Badger-Fisher system. The capacity of the Two Medicine Canal was not sufficient, however, to deliver all of the water requested and needed.—*R. M. Snell.*

FLATHEAD PROJECT.

At Pablo Feed Canal a pipe crossing was placed by Government forces at Mikes Creek, involving 155 cubic yards of excavation, 60 linear feet of 18-inch galvanized pipe, 800 board feet of lumber, and 55 cubic yards of back fill.

At Dry Creek headworks excavation amounted to 200 cubic yards; concrete, 24.8 cubic yards; back fill, 295 cubic yards; and grouted paving, 5 cubic yards.

At Dry Creek Canal excavation by Government forces was in progress at various points along the canal between stations 66+00 and 273+00 and amounted to 1,150 cubic yards, all class 1. On the 13th Russell & Hove commenced work under contract 858, schedule 1, item 1, finishing canal section, and work under item 2, concrete lining, was commenced on the 28th. Under item 1, 1,250 linear feet were completed during the month between stations 199+00 and 186+50, and under item 2, 1,580 square feet were completed from stations 199+00 to 198+00.

The first cutting of alfalfa was nearing completion. A large percentage of the grasshoppers were exterminated, and the outlook in this respect was much more encouraging.

Consolidated statement of cash, investment, and capital funds June 30, 1921.

	Current month.		Balance.	Subtotals.	Total.
	Debits.	Credits.			
Group 1—Cash:					
Cash with Treasurer United States reclamation fund.....		\$515,278.70	\$634,817.60		
Cash with Treasurer United States, unadjusted.....	\$1,596.89	577.81	1,241.52		
Cash with Treasurer United States, Yuma auxiliary fund.....		14,206.69	242,206.05		
				\$878,265.17	
Cash with special fiscal agents, reclamation fund.....	1,115,949.15	1,223,487.88	502,613.75		
Cash with special fiscal agents Yuma auxiliary.....	12,776.42	14,627.07	23,636.51		
				526,250.29	
					\$1,404,515.46
Group 2—Investment:					
Disbursement vouchers, all funds.....	1,158,279.14		163,260,051.39		
Transfer vouchers received.....	157,485.96		8,635,427.76		
				171,895,479.15	
Less:					
Collection vouchers, all funds.....		381,147.66	37,489,753.08		
Transfer vouchers issued.....		157,485.96	8,635,427.76		
				46,125,180.84	
Project net investment ¹					125,770,298.31
Total.....					127,174,813.77
Group 3—Capital fund:					
Sales of public lands.....		159,486.07	102,544,748.76		
Sales of town-site lots.....			540,002.22		
				103,084,750.98	
Potassium rent and royalties.....		2,627.76	13,044.30		
				13,044.30	
Proceeds oil leasing act, past production.....			1,614,296.67		
Proceeds oil leasing act, current production.....			85,553.15		
				1,699,849.82	
Bond loan.....			20,000,000.00		
Less repayments.....	100,000.00		1,000,000.00		
				19,000,000.00	
Rio Grande dam appropriation.....			1,000,000.00		
Net increase compensation fund.....	180.72	77,042.68	1,872,656.47		
Judgments, court of claims.....			450,118.65		
Yuma auxiliary land sales.....			54,393.55		
				450,118.65	
				54,393.55	
					127,174,813.77
Total.....	2,546,268.28	2,546,268.28			127,174,813.77

¹ Analysis of project net investment:

Net investment in reclamation fund projects.....	\$125,981,747.32
Collection vouchers, Yuma auxiliary fund project.....	\$424,080.63
Less disbursements.....	212,631.62

Net credit investment Yuma auxiliary project..... 211,449.01

125,770,298.31

Live stock was in excellent condition.—*N. B. Hunt.*

FORT PECK PROJECT.

June weather was favorable for construction work up to the 18th, after which rains and high water caused considerable delay. The total rainfall was 7.33 inches, of which 5.38 inches fell within the 48-hour period ending at noon of the 20th. Of this, 2.6 inches fell in two hours. Streams were at flood stage for several days, and damage to canals from cross drainage was considerable.

The siphon at Station 268 on Poplar River West Canal B was completed, and the camp moved to the siphon on Poplar River East Canal Station 628. The P. & H. dragline worked throughout the month on C Canal. On Big Muddy division the backfilling of structures placed in 1920 was completed, and the placing of lock joint pipe farm turnouts was resumed.

Crop prospects were better than at any time during the past four years, but grasshoppers were doing considerable damage.—*S. A. Kerr.*

GENERAL OFFICES.

Washington office.—Director Davis was in the office during the entire month, except for two short trips to New York. He appeared several times before the House and Senate Committees on Irrigation.

Assistant Director Morris Bien was in Chicago on June 24 and 25, attending the annual meeting of the National Board of Directors of the American Association of Engineers.

Chief Counsel Ottamar Hamele was away from the office from June 2 to 9 on account of sickness, which confined him to the hospital.

During the absence of both the director and the assistant director on June 25 Mr. Hamele was designated acting director.

During the month considerable time was spent in the preparation of a more detailed report to the Secretary on the investigation of irrigation possibilities in the Lower Colorado Basin and Imperial Valley, assistance in the preparation of the report being rendered by Mr. Harold Conkling, of the Denver office.

During the month the following matters were submitted to the Secretary and action was taken as indicated:

June 1, recommending that no increases be made to bondholders on the Orchard Mesa, Grand Valley project, through a decrease in the estimated cost of rehabilitating the project, approved June 14.

June 1, recommending approval as to form of contract with the Geary Investment Co., Pacific Coast Mint Co., and Klamath Mint Co. for the sale to these companies of perpetual right and use of sufficient water from Upper Klamath Lake to irrigate 7,100 acres, for which contractors agree to pay \$1,775; approved June 2.

June 10, recommending execution of contract with the city of Torrington, Wyo., providing for the delivery for a period of two years of a maximum of 125 kilowatts per month for an estimated amount of \$25,000; approved June 10.

June 13, recommending that authority be granted to execute a contract with the Salt Lake Commercial Club and the Chamber of Commerce for an investigation of the feasibility of an irrigation project in Green River Valley, Utah, \$15,000 each to be advanced by the Commercial Club and the United States for the purpose; approved June 13.

June 14, recommending the execution of a contract with the State of Oregon for an investigation of the feasibility of the Owyhee project, \$5,000 each to be advanced by the State and the United States for the purpose; approved June 15.

June 16, recommending that water rental contracts for 1921 on the Chinook division, Milk River project, be made upon the basis of the proportionate part of the actual cost of operation and maintenance, to be determined at the end of the irrigation season; approved June 16.

Visitors to the Washington office during the month included the following: William Godfrey Sutton, of the South African Government, who will spend the better part of a year in studying Government reclamation and other projects; Dr. Nathan Boyd, of Las Cruces, N. Mex.; Messrs. De Gove, Feuille, and Touche, French engineers, who recently visited some of the projects; W. W. Schlecht, former project manager of the Yuma project; Kristian Tylvad, agricultural engineer, Copenhagen, Denmark; Sims Ely, Arizona; and N. E. Webster, jr., the first chief accountant of the Reclamation Service.

The work of the office was chief.

Denver office.—The chief engineer left for Washington, D. C., on June 4 and returned to Denver on June 28. Assistant Chief Engineer R. F. Walter returned on June 8 from a visit to the Strawberry Valley project. Assistant Chief Engineer Charles P. Williams was in the Denver office the entire month. Designing Engineer J. L. Savage and Engineer James Munn spent about 10 days in Pueblo and vicinity to consult with State and city officials and other individuals interested to make an investigation and report as to what irrigation or other like projects were injured by the recent floods in Colorado, and particularly an estimate of the damage done in and around Pueblo and approximate cost of reconstruction. Official visitors in the Denver office during June included Messrs. A. N. Gullickson, William F. Kubach, H. N. Bickel, H. D. Comstock, W. J. Egleston, and George A. Hammond.

In the Designing Section there were prepared preliminary designs and estimates for Boulder Canyon Dam, Colorado River storage project; Slick and Cold Springs flumes, siphons, and minor structures, King Hill project; advertisement and drawings for purchase of metal work and gates, Klamath project; designs for various flumes, siphons, and minor structures, Lower Yellowstone project; designs for enlargement of flume on Nelson Reservoir South Canal, Milk River project; designs of culverts, siphons, and other minor structures, North Platte project; maps showing flood areas and damaged district along the Arkansas River, and preliminary designs and estimates for flood-control reservoirs in Rock Canyon and on Fountain Creek, estimates for relocation of railroad tracks and channel improvements, Pueblo flood investigation; designs for radial gates, Wind River Diversion Dam, Riverton project; and design for Paterson Canal turnout, Yuma Auxiliary project. Work was also continued on standardization drawings for lock-joint pipe, turnout gates, and radial gates.

The principal work accomplished in the Electrical Section consisted of inspection of the various pumping plants, Huntley project; the preparation of designs and specifications for the Thomas Point pumping plant, Lower Yellowstone project; consideration of matters relative to the purchase of the American Falls power rights from the Idaho Power Co., Minidoka project; revision of valuation of the Reno power plant, Newlands project; preparation of designs of the north

tunnel outlet of the Pathfinder Dam, North Platte project; studies of the alternative designs for the Shoshone power-plant buildings, Shoshone project; preparation of drawings for the B Lift pumping plant and studies of the Yuma Valley drainage plant, Yuma project; and continuation of studies on the Boulder Canyon power plant, with a revision of estimates for various sizes of installation, Colorado River storage project.

In the Legal Division miscellaneous applications under House Joint Resolution No. 52 were examined, recommendations made for approval, and instructions delivered to the project managers authorizing delivery of water pending the approval of such applications. Forms of contract were made and the contracts executed for delivery of water for storage purposes, Carlsbad project, cooperative contract with Wyoming for investigations on the so-called Casper project, supplemental contract with Austin Machinery Co. for construction of ditch-cleaning machines, and contract with Bucyrus Co. for a large electric shovel and dragline for excavating work at Tieton Dam. Collections were made of delinquent rentals under leases of land under the Bowman project, Pecos River withdrawn area, Oregon secondary projects, and Palouse project, Washington. Several leases of land were made on Marias withdrawn area, Montana, in accordance with advertisement. Conferences were also held on the Riverton project relative to settlement of water rights and the recently formed Midvale Irrigation District.

An average of 386 letters per day was received during the month; 1,439 vouchers were handled, involving a total amount of \$439,810.97. In the Purchasing Division 349 advertisements were issued and 659 vouchers prepared, involving a net expenditure of \$304,196.64. Transfers were effected between the projects amounting to \$3,152.66.—*F. E. Weymouth.*

DISTRICT COUNSEL TRIES AIR ROUTE.

District Counsel J. R. Alexander, on his return to headquarters in Montrose, Colo., from the Strawberry Valley project, Utah, used an airplane for the portion of the trip between Grand Junction and Montrose. Mr. Alexander writes of his experience as follows, and all other district counsel in the service should note carefully what he says:

"While the trip was a very enjoyable one, that mode of travel will not be employed very extensively by me, and I do not recommend it to other district counsel, as I find in making up my expense account that there is considerable difference between airplane fares and railroad fares which must be personally borne by the one who seeks to fly high."

One of the great advantages of dairying over steer feeding is that after a farmer has fed all his crops and sold his produce he still has the machinery left for producing more of the same kind, while when the steer is sold a new animal or machine must be purchased.

The Reclamation Record.

Issued monthly by the Reclamation Service, Department of the Interior, under the authority of the Secretary of the Interior.

Copies of the RECLAMATION RECORD will be sent free of charge to any water user on our reclamation projects. The subscription price to others is 75 cents a year, payable in advance. Subscriptions may be forwarded to the chief clerk, United States Reclamation Service, Washington, D. C., and remittances (postal money order or New York draft) should be made payable to the special fiscal agent, United States Reclamation Service. Postage stamps will not be accepted.

Material for publication in the RECLAMATION RECORD should be addressed to *Editor*, United States Reclamation Service, Washington, D. C., and should be mailed in time to reach the editor not later than the 14th of the month in order to insure publication in the succeeding month's issue of the RECORD.

HUGH A. BROWN, EDITOR.

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Reclamation Record.

[To be used only by persons who are NOT water users on the projects of the U. S. Reclamation Service.]

_____, 1921.

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U. S. Reclamation Service,

Washington, D. C.

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Please enter my name on the mailing list of the RECORD, as I am interested in the reclamation work. I have read copies of the paper and am convinced that it is doing a good work and am in hopes that Congress will see fit to make it permanent.—*V. V. Caldwell, King Hill, Idaho.*

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 FRANCIS M. GOODWIN, Assistant Secretary.
 EDWIN S. BOOTH, Solicitor for the Interior Department.
 CHARLES V. SAFFORD, Administrative Assistant to the Secretary.
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FIELD LEGAL OFFICES.

Boise, Idaho.—B. E. Stoutemyer, district counsel. Projects: Boise, Minidoka, King Hill, and Jackson Lake Enlargement; R. M. Patrick, district counsel located at American Falls, Idaho.

Denver, Colo.—Law section office of chief engineer: R. E. Roddis and Armand Offutt, district counsel; J. J. Buck, assistant district counsel.

El Paso, Tex.—P. W. Dent, district counsel. Projects: Rio Grande, Carlsbad, and Hondo.

Helena, Mont.—W. J. Egleston, district counsel, Helena, Mont. Projects: Blackfeet, Flathead, Fort Peck, Huntley, Milk River, St. Mary Storage, Sun River, North Dakota Pumping, Lower Yellowstone, and Shoshone.

Mitchell, Nebr.—J. N. Beardslee, district counsel. Projects: North Platte and Belle Fourche.

Montrose, Colo.—J. R. Alexander, district counsel. Projects: Grand Valley, Uncompahgre Valley, and Strawberry Valley.

Portland, Oreg.—H. L. Holgate and D. G. Tyree, district counsel. Projects: Yakima, Okanogan, Umatilla, and Klamath.

San Francisco, Calif.—Henry A. Cox and A. B. Fullerton, district counsel, 349 Pacific Building. Projects: Salt River, Yuma, Orland, and Newlands.

PROJECT ORGANIZATION.

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Riverton Project.—H. D. Comstock, project manager, Riverton, Wyo.; R. M. Conner, engineer; G. H. Baird, chief clerk; J. C. Thrallkill, fiscal agent.

St. Mary Storage Division.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk; H. E. Bruce, fiscal agent.

Salt River Project.—Being operated by the Salt River Valley Water Users' Association; C. C. Cragin, general superintendent and chief engineer, Phoenix, Ariz.

Shoshone Project.—J. S. Longwell, project manager, Powell, Wyo.; J. R. Iakisch, engineer; C. M. Jump, superintendent of irrigation; W. F. Sha, chief clerk; Miss L. C. Drinkwalter, fiscal agent.

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Yuma Project.—P. J. Preston, project manager, Yuma, Ariz.; R. M. Priest, superintendent of construction; S. A. McWilliams, engineer, Yuma Mesa Division; E. R. Scheppelmann, chief clerk; E. M. Phillebaum, fiscal agent.

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Flathead Project.—C. J. Moody, project manager, St. Ignatius, Mont.; F. F. Smith and N. B. Hunt, engineers; J. M. Swan, chief clerk; J. P. Siebenelcher, fiscal agent.

Fort Peck Project.—S. A. Kerr, project manager, Poplar, Mont.; Henry Berryhill, chief clerk and fiscal agent.



SHOSHONE PROJECT OFFICE AND EMPLOYEES.

Left to right—Back row: C. A. Barnett, instrument man; W. G. Shapcott, draftsman; I. B. Hosig, office engineer; G. L. Blakeslee, draftsman; J. R. Iakisch, engineer; S. A. Krajicek, draftsman; H. V. Hubbell, assistant engineer; J. J. Hammond, assistant engineer; W. A. Green, draftsman.

Front row: W. E. Morgan, master mechanic; Dale V. Willoughby, clerk; W. L. McGuire, bookkeeper; C. O. Swanson, purchasing agent; S. S. Kirkpatrick, storekeeper; George H. Edwards, stenographer (resigned); H. H. Johnson, assistant engineer; W. F. Sha, chief clerk; L. H. Kline, special fiscal agent; J. S. Longwell, project manager; C. M. Jump, superintendent of irrigation; C. S. Blair, property clerk; Mrs. Olive C. Knights, clerk; L. W. McKemey, timekeeper; Miss Annie E. Higgins, stenographer; C. A. Smith, costkeeper; Miss Clara F. Atkins, telephone operator.

The Reclamation Record

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SEPTEMBER, 1921



DRAGGING AND LEVELING ON THE NORTH PLATTE PROJECT



WHALEN DIVERSION DAM
AND HEAD WORKS
FOR INTERSTATE AND
FORT LARAMIE CANALS

LOWER YELLOWSTONE PROJECT OFFICE

- 1 L. H. MITCHELL, PROJECT MANAGER
- 2 F. C. YOUNGBLUTT, ENGINEER
- 3 C. A. DENMAN, CHIEF CLERK
- 4 MISS RUTH LUNDIN, CLERK AND FISCAL AGENT



234

DEVELOPMENT IN THE NORTH PLATTE VALLEY, NEBRASKA-WYOMING.

By Andrew Weiss, Project Manager, and A. M. Easterday, Assistant Engineer, North Platte Project.

THE question frequently arises, "Does irrigation pay, and how far-reaching is its influence?"

It has occurred to some inquiring minds that the best way to show its influence and results is to take occasional inventories of our affairs or those of us residing within irrigated territories. This inquiry was supplemented with the desire of the Reclamation officers to know to what extent trade and industrial activities were developed by the extension of irrigated lands. Without going to the expense of gathering exact data it was decided by the local Reclamation officials to secure this information by and with the cooperation of all interested chambers of commerce, bankers, community clubs, and other public agencies available. From these sources of information were obtained the following trade statistics for the period, between and including Bridgeport, Nebr., at the eastern extremity, and Whalen, Wyo., at the western end of the valley, a distance of 91 miles. This territory is frequently referred to as the Scottsbluff country, since the city of Scottsbluff is located in the approximate center of the valley and contains the largest number of inhabitants.

The accompanying trade statistics were compiled from the data furnished by these local community and commercial clubs and represent the aggregate of all cities and towns within this territory:

Wholesale purchases of manufactures.

Items.	Value.	
	1919	1920
Dry goods, clothing, shoes.....	\$1,153,243	\$1,692,660
Lumber.....	937,952	1,047,768
Automobiles, trucks, etc.....	1,040,143	1,260,892
Groceries.....	1,286,131	1,946,465
Hardware.....	616,096	783,702
Coal.....	307,803	496,407
Feed, flour, bags.....	676,836	729,016
Farm implements.....	643,053	650,020
Machinery and supplies.....	83,226	130,525
Electrical supplies.....	13,642	35,232
Jewelry and instruments.....	117,631	166,043
Drugs and sundries.....	313,585	504,344
Cigars.....	36,435	84,912
Furniture.....	197,433	213,760
Other merchandise.....	135,794	270,029
Total.....	7,562,058	10,011,775

In addition to the foregoing the county assessors have kindly furnished the aggregate values, assessed and real, of property as it appears on the tax records of the counties which are partly covered by this irrigated area.

No segregation has been attempted of the valuation of farm and other property, as well as automobiles and trucks belonging to the unirrigated territory but

it may be roughly estimated that the total of values pertaining to the "dry country" alone would not exceed 10 per cent of the values given in the following table:

Property valuations, 1920.

	Assessed.	Real.
City property.....	\$2,964,842	\$14,574,125
Public utilities.....	469,000	2,597,000
Farm and other property.....	11,686,568	60,432,840
Automobiles and trucks (5,983).....	1,633,535	8,166,785

As a rule, the banking statistics of a community furnish a reliable index of its prosperity and general business advancement. Through the courtesy of the local bankers we obtained a record of the banking statistics for the years 1890 to 1920, inclusive, giving the figures for the beginning and close of these decades. In the same table are shown also the corresponding aggregate populations of the towns, number of schools, etc.

Comparative increase of growth in the valley is represented by the accompanying figures:

Date.	1890	1900	1910	1920
Number of banks.....	1	4	13	30
Capital stock and surplus.....	\$10,000	\$70,270	\$387,500	\$844,500
Deposits.....		\$130,089	\$1,376,469	\$9,017,000
Depositors (estimated).....	300	400	5,500	27,324
Towns.....	1	1	7	14
Population of towns.....	100	500	4,316	19,243
Schools in valley.....	1	23	34	284
Student days attendance.....		61,051	197,110	675,606
Teacher days attendance.....		1,561	8,187	29,088
Churches.....	1	4	24	52

The Chicago, Burlington & Quincy Railroad reached this valley about 1900, and its road is now a part of the main line serving central Wyoming. Its road traverses the north side of the river. In 1911 the Union Pacific system built a line along the south side for about half the length of the valley. This road is now being extended 48 miles to serve lands which for the most part are just coming under irrigation.

The North Platte Valley Railroad Co. has built over 38 miles of railroad, not a common carrier, to facilitate the harvesting of the beet crop.

The accompanying table shows a more extended list of public improvements and industries:

Improvements and industries.

Churches.....	52
Schools.....	284
High schools.....	22
Consolidated schools.....	11
Grade schools.....	187
Total attendance.....	13,157
Newspapers.....	16

Improvements and industries—Continued.

Hospitals.....	6
Government experiment farms.....	2
Sugar factories, operating.....	4
Sugar factory, under construction.....	1
Hydro-electric power plant.....	1
Electric light and power plants.....	4
Brick and tile plants.....	2
Foundry.....	1
Machinery plant.....	1
Flour mills.....	2
Feed mills.....	2
Elevators.....	4
Cement-block factories.....	3
Creameries.....	2
Ice cream factories.....	2
Ice plants.....	2
Bottling works.....	2
Pickle salting station.....	1
Monument works.....	1
Potash plant.....	1
Farming and stock feeding.....	1

From the local railroad agents a record of carload shipments was obtained for the years 1919 and 1920.

Outgoing freight shipments were as follows:

	Car lots.	
	1919	1920
Hay.....	644	354
Potatoes.....	1,511	1,038
Cattle.....	1,815	1,378
Wheat.....	405	681
Sheep.....	457	605
Flour.....	40	32
Sugar.....	1,267	1,922
Miscellaneous.....	5,794	6,051
Total shipments.....	11,933	12,062

The Interstate Division of the North Platte project was completed in 1915. Its progress of development began with the irrigation of the first unit in 1908, and during the succeeding period up to and including 1915 additional units were added as rapidly as fund conditions permitted. The accompanying table gives the crop census of this division alone, occupying an irrigable area of about 110,000 acres. Owing to the lack of data it is difficult to obtain a similar record of the private irrigation districts' or companies' territories, but it may be roughly stated that the aggregate crop value of the remainder of the valley would present an approximate total of three times that of the Interstate Division. In addition, there are 120,000 acres subject to irrigation to which canals are now being built as rapidly as available funds will allow.

The following information concerning sugar beets was furnished by the Great Western Sugar Co., and represents the tonnage and value of the beet harvest of the entire valley for the year 1920:

Acres harvested.....	68,308
Tons beets harvested.....	690,508
Amount paid to growers.....	\$8,295,782.55
Tons per acre.....	10.11
Price per ton.....	\$12.014
Average value per acre.....	\$121.45

Interstate division crop production.

[111,829 acres irrigable, 88,000 acres irrigated.]

	1919	1920
<i>Commodity.</i>		
Alfalfa hay.....	\$1,051,635.00	\$674,830.00
Alfalfa seed.....	450.00	450.00
Sweet clover seed.....	12,906.00	7,890.00
Barley.....	125,333.75	54,116.70
Beans.....	2,241.00	1,983.00
Beets (sugar and tops).....	1,279,410.00	2,168,637.50
Beets (stocks).....	2,364.00	2,364.00
Cane.....	1,304.00	2,448.00
Corn fodder.....	416.00	292.00
Corn.....	205,008.70	143,753.25
Hay.....	6,470.00	8,100.00
Millet seed.....	1,741.50	3,235.00
Oats.....	127,852.00	124,904.20
Pasture (alfalfa, at \$15).....	35,850.00	18,645.00
Pasture (sweet clover, at \$15).....	5,415.00	5,670.00
Potatoes.....	713,257.00	639,549.75
Rye.....	7,213.75	5,151.00
Wheat.....	314,518.40	144,679.50
Miscellaneous.....	22,890.00	34,310.00
Total cropped (85,690 acres).....	3,916,736.10	4,043,635.90
<i>Livestock.</i>		
Horses.....	728,000.00	720,000.00
Mules.....	15,510.00	17,600.00
Cattle.....	450,000.00	325,000.00
Sheep.....	24,500.00	5,500.00
Hogs.....	168,000.00	70,000.00
Fowls.....	39,288.00	38,400.00
Bees (hives).....	2,604.00	2,560.00
Total.....	1,428,502.00	1,179,060.00
Equipment.....	800,000.00	970,000.00

NOTE.—There is an investment of \$350,000 in dairy cattle.

To the eastern farmer, business man, banker, and professional man it is usually not clear that the development and extension of irrigation in the West materially affect his own prosperity at home. He is unmindful of the large amount of purchases which must be made by his western brother to supply his necessities, conveniences, and luxuries.

By reference to the itemized trade statistics given at the beginning of this article it will be seen that the total aggregate market value of goods manufactured in the eastern portion of the United States, which are consumed by people in the North Platte valley, is approximately equal to the gross value of the produce from these irrigated farms. Judging further by census statistics the population supported by these business and industrial enterprises thus brought into being in the East is approximately equal to the population supported by these reclaimed deserts in the West. Thus, it is shown that an increase of prosperity in one portion of the United States does directly affect the prosperity, business expansion, and well-being of other sections, particularly those supported by industries and trades complementary to each other, as farming is complementary to the manufacturing industries and trades by reason of the market which is thus created and the increased purchasing power which results therefrom.



ALTHOUGH the trend of industry and commerce is swinging slowly back to normal, general conditions are not such as to warrant undue optimism for the fall and winter business. We have a long hill to climb before reaching a complete readjustment. Economists are advising caution while at the same time expressing confidence that conditions are steadily improving. Farmers are advised to make contracts for their products when the prices show a fair profit, and not hold up stocks in expectation of rising markets later. Most agricultural communities are suffering by reason of a lack of credit. The inflow of cash from a heavy turnover of crops will stimulate business and improve labor conditions. Unemployment is responsible in part for lessened demand for food products and a falling off in merchandise sales. The purchasing power of a dollar is greater to-day than at any time during the past five years. With normalcy restored to industries it may be less next winter. Ready money in the farmers' hands right now would take up a lot of the slack in all kinds of business.

The problem of the farmer cited here is one which demands his best thought and judgment.

Statistics recently compiled show that out of every dollar the consumer pays for the products of the farm the farmer gets about 34 cents, the balance, or more than 66 per cent, being absorbed in distribution costs.

Under Denmark's cooperative marketing system, the spread between the farmer's price and the consumer's cost is only 10 cents on the dollar. While no one regards it as possible in America to equal Denmark's success in this direction, many do believe that a reduction to 20 cents can be obtained by better systems of marketing and selling. If the farmer sought to retain all the savings, amounting to 42 cents, the public would not be interested. On the other hand, if a practical plan can be found which in effect will bring about a division of the amounts saved between the producer and the consumer, the active cooperation of the public would naturally follow.

Discussion of this important matter finds the public rather apathetic and distinctly in a "show me" frame of mind. The lamentable and often disastrous experiences it has had with various cooperative buying associations are of too recent occurrence to encourage any hope of a remedy which will soon

lighten their present heavy burdens. Confidence in proposed panaceas has been shattered. Some are still smarting from the wrongs suffered in experiments with direct purchases and deliveries by parcel post. In innocence and guilelessness they set forth to crush the grafting middlemen, and sent their good coin to the downtrodden farmer. They had cheering visions of day-old eggs; of plump broilers; of old-fashioned, home-cured hams; of delectable vegetables, fresh from dewy gardens. Did they get them? Tell the world, they did not. Did the farmer split that huge cost of distribution? You know darned well he didn't. He charged dealers' prices; and, in addition, the consumer paid for the packages and the postage. So far as the public is concerned, it expects to remain as at present—the goat of the old system; but at least it can see the goods before digging up the cash.

In Washington a lot of us became greatly enthused when we learned that free stalls were to be provided for the near-by truckers, who would sell their products direct. Hosts of us climbed out of our beds at early dawn and hied to the market place with huge baskets for our purchases. You know how painful was our disillusionment when we began pricing the array of produce on the wagons. There was no appreciable margin of difference in prices, but there was a big difference in quality over the same truck sold in the rented stores by the regular dealers. The quality of the latter's goods was much the best. Still hopeful and wishful, some of us filled our gas tanks and flivered forth to the country. "Surely," we said, "we will now find bargains." Not so. The country farmer quoted us prices based on the daily retail market reports, and would not even allow for transportation.

The national real estate convention in Chicago passed resolutions indorsing a fixed and comprehensive policy of reclamation. This action by over 9,000 real estate men of the Nation is a virtual indorsement of the general land legislation now pending in Congress and is a great boost to reclamation.

Fruit growers of Colorado, Idaho, Oregon, and Washington are much encouraged with the market outlook for their crops this year. Late estimates for the eastern crops are greatly reduced, and recent reports from

England's apple orchards show only 30 per cent of normal yields. This shortage predicates a good market for Yakima and Wenatchee apples, pears, and jam. England's purchasing ability is constantly improving owing to rapid restoration of normal industrial conditions.

Eastern produce buyers on the Yakima project are contracting for large quantities of valley spuds at prices ranging from \$20 to \$24 a ton, the general average being about \$20. Many of the growers are cleaning out their stocks at this price, which is said to show a fair profit. Prices offered in Colorado and Idaho have ranged slightly lower, and there is a tendency on the part of many growers to hold their potatoes for a rise. Idaho growers have formed an organization to bring about a reduction in freight rates, which are claimed to be discriminatory and unreasonable. Using the argument that the present rates were established by the President during war times, the potato growers insist that our Chief Executive is authorized to reduce them.

NOTED HERE AND THERE.

Arizona, Salt River project.—The superior quality and flavor of Chandler peaches was demonstrated by the large purchases made by the Harvey Co. Many tons were delivered for use in the Harvey hotels and on the Santa Fe dining cars.

California, Orland project.—The Orland Cheese & Butter Co. has offered a unique service in furnishing a cold-storage plant for the use of the public. Three large rooms of the plant have been arranged with lockers of various sizes for individual usage. The rental of the smaller lockers is only 50 cents per month. For more commodious space the charge is \$2.50 per month. A uniform temperature of 35° is maintained, which keeps meats and fruits indefinitely.

Renting out turkeys to eradicate grasshoppers is Orland's latest stunt. Over in Solano County the farmers have been in a panic over the plague of hoppers, and in response to their cry for assistance Orlanders shipped several thousand turkeys to be turned into the infested fields. Valiant service was rendered, it is stated, but the turkeys suffered from indigestion owing to the fact that they were not required to exercise themselves in order to fill up on grasshoppers. The birds had only to squat in their tracks and with slight effort gorged themselves to repletion.

A ranch of 480 acres near Orland was sold recently for \$100,000. It is irrigated from six wells and pumping plants, and its new owner, Wylie P. Griffin, of Merced, Calif., is preparing to develop the entire tract in fruit, mostly figs and grapes. His selection of Orland as a place for heavy investment, this pur-

chase bringing his holdings in this vicinity up to nearly a thousand acres, and his plans for development on an extensive scale of the fruit industry at this place evince his faith in the future of this industry and his judgment that this section of the State has advantages over other places for the purpose. With a thousand acres in prospect of immediate development by one man, there seems little doubt of the future of this county as a fruit-growing center.

Colorado, Grand Valley project.—More than 1,000 refrigerator cars are being assembled by the Denver & Rio Grande Railroad in the Grand Valley for the movement of the largest peach crop in the history of the western slope, according to Special Agent Matt N. Lines, of the Colorado Public Utilities Commission.

It is estimated that nearly 4,000 cars will be necessary to move the extraordinary potato crop of the district. Arrangements have been made to supply 750 cars for the crop at Montrose, 850 cars at Olathe, 750 cars at Delta, and 100 at other points.

Experts have predicted that the potato crop of the western slope will be 20 per cent heavier than in 1920. There are a great number of refrigerator cars being held on the western slope for fruit and potato crops.

Brother Newton, of Grand Junction, who disputes our title as the first degree Reclamation optimist, writes as follows:

"The experts who have been studying the effect of the sun's rays upon fruits and vegetables not only in this country but in England and other countries have discovered that the violet rays of the sun are more noticeable in the higher altitudes such as we find in the Grand Valley and other parts of Colorado, and that these rays give to the fruits, vegetables, and cantaloupes their extra color and flavor. We can raise the foreign grape to perfection in this valley, and it is common knowledge that our peaches, pears, apples, and other fruits are better than those grown in almost any other section."

To the last opening of public land on the Grand Valley project we brought a number of families from Chicago, several of whom were fortunate in drawing farm units. Among them were Capt. and Mrs. Smith, who filed on a unit close to Grand Junction. The other day the captain breezed into Washington with his final proof and paid us a call. What he had to say about the project was most pleasing. He has his unit all under cultivation, and is entirely satisfied with his venture. "The Grand Valley project," said he, "is an excellent example of the worthwhileness of reclamation, and this valley is making steady progress. A better class of people than its settlers can not be found anywhere in this country. They are neighborly, cultured, and kindly, and everyone is imbued with faith in the future of the project."

The harvesting of early potatoes is over, and many carloads of excellent spuds were shipped out of the

valley. The yields ranged from 75 to 125 sacks per acre, and averaged about \$1.25 per hundred for the growers. The acreage this year is large and the quality fine.

Idaho, Boise project.—Owned by Idaho men and controlled by Boise and Nampa capital, the Dehydrating Canning Co. of the Western States Canning Corporation, 4 miles north of Nampa, opened for business August 15. It has been started for the further development of agricultural possibilities and to provide a home market for fruits and vegetables. The plant was incorporated last April under the laws of Idaho, and capitalized for \$50,000.

Approximately 50 men and women will be employed in the plant for a period of 10 months each year, on the fruit and vegetable pack, the company says. The remaining two months will be utilized for the packing of 1 to 10 pound cans of pork and beans, if present plans materialize.

Prunes and apples are the principal fruits which will be dehydrated the first year, according to present plans. When the second season is started, a full line of products that can be dehydrated will be put through the process. An experienced man is to be put in charge of that department. Modern equipment has been installed for the handling and dehydrating of all kinds of fruits and vegetables.

One of the interesting parts of the plant is the boiler, engine, and furnace rooms, in which are installed a 100-horsepower boiler, a 40-horsepower engine, and four large furnaces to supply hot air for the four tunnels in which the dehydrating and drying is done. The tunnels have a capacity for handling 20 tons of prunes each process time, which requires 16 hours.

The tunnels are built of brick and are plastered. They are 6 feet wide and 50 feet long. Loaded cars containing green fruits will be stored, then heat applied ranging from 110° to 140°. The heat is evenly controlled by regulators located at the end of the tunnels into which the heat is piped from the furnaces.

At one end are four large revolving fans, used to evenly distribute the heat through the fruit, assuring an even dehydrating and absorption of the moisture from the product. A fifth tunnel has been built and will be used for the cooling of the products after they have been removed from the heated tunnels and before prunes are ready for packing into boxes of 25 pounds each.

The Boise Valley and adjacent territory is adapted to the production of every variety of vegetables and principal fruits used in canning, the promoters believe. The possibilities of the berry industry are said to be unlimited.

According to figures, southern Idaho for the past five years has been spending more than \$500,000 for canned fruit and vegetable products sent from foreign

States. Shipments will be made from this plant to Idaho, Montana, Washington, and Oregon, probably extending as the plant enlarges, the manufacturers hope. The consumption of corn in the foregoing territory is listed as 400,000 cases annually.

As soon as the plant is in full operation, moving pictures are to be taken of the interior and filmed at different theaters over the country, as educational features, showing one of Idaho's industries.

Word was received in the offices of the university extension bureau from the American Jersey Cattle Club, New York, that Eminent's Dora B., a cow owned by S. E. Gearhardt, of Boise, has completed an official record which makes her the champion senior 2-year-old cow in the State. The cow produced 8,528 pounds of milk in the year's testing period, the letter from the club states. The milk contained 497 pounds of butter fat. Eminent's Dora B. is 3 years and 7 months old, records show.

Idaho, Minidoka project.—From a local paper we clip the following:

"How would you like to be able to go out to your own garden, with an ordinary strawberry box, pick 15 berries and find that you needed sideboards to hold them?

"This is just what Frank Valentine, who lives just at the edge of Rupert did out of his patch the other day.

"We have three rows of Kellogg Mammoth berries that are extraordinarily fine," said Mr. Valentine. "For table use we slice them the same as tomatoes."

"To give an idea of how thick the plants bear, on one bush, while the berries were forming, Mr. Valentine counted 185 matured fruit, while there were 50 that he wasn't sure of.

"Off of six rows, about 150 feet long, 700 boxes of strawberries were sold, besides what the family used and the many given away. These berries are annuals, and the plants have been cut down, the owner expecting to get another crop before the season is over.

"I can make \$500 clear per acre off of strawberries here," says Mr. Valentine. "With the proper food for the land and care in growing there is no country better adapted for results than this."

"Mr. Valentine uses plenty of manure on the soil and the plants are given plenty of water. Runners are cut, the plants growing to be monsters, with about 2 feet between each plant."

Although only six years since its inception, breeding of Shorthorns as an industry is now followed by about eight Minidoka County farmers, aside from Frank Sullivan's Sons, who have gone into the business in wholesale fashion, and whose herds, now numbering some 130 head, have placed them in the front rank as Idaho Shorthorn breeders.

Montana, Flathead (Indian) project.—From the St. Ignatius Post we clip the following:

"A local dairy enthusiast, with a penchant for figures, has evolved the following, which we will hand over to our readers without comment, except to say that it's no wonder we're poor:

"There are in the Mission Valley about 500 automobiles of all kinds.

"They cost, when new, an average of \$1,000 each. Total, \$500,000.

"Gasoline and upkeep, repairs, tires, etc., amount to at least \$200 per car per year. In one year the total expense bill is \$100,000; in five years, \$500,000.

"Total cost of cars and operating expense in five years is \$1,000,000.

"Suppose that five years ago we had bought dairy cows for \$1,000,000. At \$100 each, we could have bought 10,000 cows.

"A good dairy cow should easily yield an income from milk \$20 per month, or \$240 per year. In five years, \$1,200.

"The 10,000 cows would have made us, in five years, \$12,000,000.

"And we would still have the cows, and their offspring for five years.

"Figuring that half of the offspring would be females, and that they would begin producing when 3 years old, we have—

"But here we must call a halt; our space is limited, and we don't want to see our friend get tangled up in a maze of figures from which he can not be extricated.

"And, besides, if he brings in twenty or thirty thousand new cows—offspring of the original 10,000—who's going to milk 'em all? And the calves—great Scott! suppose the calves got out!"

Montana, Sun River project.—In common with every other reclamation project constructed in the semiarid region, development in the Sun River Valley proceeded slowly and with numerous setbacks. Occupied for many years as a cowman's paradise, its people had to be won to intensive farming by the hard knocks of drought. The first project farmers were largely made up of inexperienced men, and their struggles were severe. There was opposition on the part of many settlers to the reclamation plans and several units of the original project were eliminated. Seepage developed in some sections and complicated the problem. Successive years of drought, with almost total failure of the dry-land crops, brought realization finally to the settlers that irrigation was essential. From that time on cooperation with the Service became general and real progress followed. To-day the Sun River Valley has its place in the galaxy of Montana's fair valleys. It is forging rapidly to the front and its future outlook is as bright as that of any section of the Northwest.

A drive over the valley at this time is a most delightful experience. Thousands of acres of splendid grain and green alfalfa spread out before you. Fine fields of potatoes and excellent gardens are on every ranch. Commodious ranch homes and buildings have replaced the log shanties. An atmosphere of prosperity and success pervades the scene.

Don't forget that the Sun River Valley offers the settler the best of opportunity to acquire good land at reasonable prices, with fine neighbors, good markets, and excellent schools.

New Mexico-Texas, Rio Grande project.—It is estimated that the Mesilla Valley pink meat cantaloupes shipped out of the valley required nearly 600 cars and had a farm value of \$500,000. In addition, 30 cars of fine cabbage, valued at \$30 per ton, were exported.

New ideas are always welcomed by men and women who lay claim to twentieth century progress. If the individual is a farmer and the idea pertains to the growing of some product, then it is doubly appreciated. Everyone likes to learn something about what the other fellow is doing. It helps to solve perplexing problems.

Take the case of L. E. Freudenthal, of Las Cruces, manager of the Freudenthal farms in Dona Ana County, N. Mex., who uses as pig feed the roots of ordinary cat-tails, that grow in profusion along the irrigation and drainage ditches on his holdings. His pigs, feeding on these roots three months, gained as much weight as those fed on alfalfa and grain.

A brief history of the test will be of interest to the farmers all over the country, for the reason that cat-tails grow in all parts of America.

Before the slump in the price of hogs began, Mr. Freudenthal looked around for cheaper feed.

"While we were making the investigations," he said, "one of the men let some pigs run. They made for the cat-tails near by and seemed to enjoy the tender roots. To build a portable fence around the patch was a simple matter.

"For three months we fed the pigs on cat-tails and the results are so good that we are continuing this kind of feeding to our entire drove. We will finish the pigs with grain."

The revival of the grape industry, which flourished in the Mesilla Valley as early as 1681, was the principal subject discussed at the Fourth of July picnic at Lightfoot's grove at Anthony. Officers and members of the Ber'no-Anthony unit of the Dona Ana County Farm Bureau were hosts. More than 250 men and women, many of them accompanied by their children, were in attendance. Judge W. J. Smith was chairman and master of ceremonies.

Following an old-fashioned basket dinner in which the choicest products of the farm, orchard, vegetable garden, and poultry yard figured in a way that left

nothing to be desired, Judge Eylar presented the subject of the revival of the grape industry in Dona Ana County where, according to the chronicles, it was introduced by the Franciscan friars in 1680 and flourished for more than two centuries afterwards. It is a matter of record that the Mesilla Valley, peopled by colonists from Paso del Norte, the present site of Juarez, was famous for its vineyards in its early history.

In the discussion that followed, Charles Miller, of Anthony and El Paso, expressed the opinion, based upon personal experience, that practically every variety of European grapes could be grown profitably in Dona Ana County. He also voiced the belief that in the not distant future most of the farmsteads in Dona Ana County will each have at least a few acres of land in grapes.

Dean Vaughan's address was made up of interesting incidents in the colorful history of New Mexico.

Mr. Brook, who followed, spoke briefly of the work of the Elephant Butte Irrigation District and of what the United States Reclamation Service has done and is doing for the farmers in this district. He emphasized the fact that water for irrigation purposes is delivered to users in the Rio Grande district at a much lower rate than under any other project in this country.

"Dona Ana County has everything to make this a great producing district," said Mr. Brook. "The land is fertile, the water supply is ample, and we have more days of growing weather than any other part of America. All we need is earnest, ambitious men with some capital and practical farming experience to make this the garden spot of the Southwest."

Commenting on the significance of the discussion in regard to the grape industry, Judge Eylar said:

"Judging from the interest manifested by farmers in various parts of Dona Ana County, I should say that the data committee, headed by County Agent Stockdale, will have the support and cooperation of the people of the valley. There is every reason to believe that the grape industry can be developed to a highly profitable point. The records show that practically all kinds of grapes, including the finest European varieties, thrive in this district."

South Dakota, Belle Fourche project.—The annual farm picnic has become a project institution. Each year the attendance grows, attesting both the popularity of the affair and the progress of the project. These picnics are devoted to a certain amount of conference and discussion of project and crop matters, with plenty of fun and social enjoyment. The place is the demonstration farm, near Newell, where accommodations are ample for entertaining a large crowd. Always there is an abundance of good things to eat.

The demonstration farm has been holding a series of daily classes for a camp of boys who are studying live stock and crop relation methods, irrigation, and

other subjects. The youngsters evinced much enthusiasm and interest in their classes. An annual club camp is planned as a regular feature of the farm's activities.

Washington, Okanogan project.—An apricot bearing the notation, "The largest cot in the world," attracted a lot of comment in Omak, where it was on display for a week.

This particular member of the local apricot family came from the Barton Robinson orchard, just north of town, and measured 9 inches one way and 8½ the other. Best of all, it had a numerous flock of brothers and sisters who crowded it closely for Jumbo honors and the quality was A1.

The local soft fruit crop has been generally very successful this season; in fact, had most orchardists not been so busy with their large apple crops much more cash could have been realized in a number of cases.

Express shipments of packed cherries netted the growers an average of 15 cents a pound, while the loose car-lot shipments brought 8½ cents. Several orchardists made individual parcel-post shipments direct to the consumers and made a lot more than these figures.

Apricot markets have remained in a strong condition, with prices to growers averaging \$60 a ton net, with higher prices realized by a number of parcel-post shipments.

Offers for early pears are being made at \$40 a ton for the fruit loose in apple boxes and good prospects in view for a cannery market for late pears.

Washington, Yakima project.—Practicing what he preaches, namely, that the Yakima Valley is the best dairying section in the United States, S. E. Chaffee bought five head of registered Holstein cows at Satsop, and placed them on his big farm at Whitstran. Mr. Chaffee will soon have as his chief herd bull, Chief of Ormsbys, a combination of the two greatest sires of any breed of dairy animals in the world.

This cheerful note from out of the desert is sung by the editor of the Review. We hope to hear it from all our projects soon:

"The Yakima Valley will slide out of hard times conditions in a very few weeks. Prices for our products are becoming more definitely established and with certain exceptions, important as they affect individual growers, but not vital to the general situation, the crops will go to market on a basis that will show a profit to the farmers. On the whole it is quite apparent that the harvest, both in fruits and general crops, will be made at a material reduction in cost over last year, a factor in itself of considerable importance in casting up a balance for the season's operations. The Review will hazard the opinion that there will be a more general liquidation of debts in the valley this year than for several seasons past and

that this district will have very nearly completed the back track to normalcy by the 1st of January."

Wyoming, Shoshone project.—Paul Craig, one of the first engineers at work on the Shoshone project, came back to Powell recently after an absence of 10 years, or more. He was here for several years prior to 1909, the year when the town of Powell was started, and made his headquarters at Corbett and Eagles Nest, before there was even a sign of a camp here at Powell. Since leaving here he has spent much time in California and other parts of the West and is now at Omaha, employed as a civil engineer for the Burlington Railroad Co.

Mr. Craig left when the project in this vicinity was commencing to be settled up, and now returns to find the section settled by a thousand families. He marvels at the change, declaring that this is one of the most successful irrigation schemes he has ever observed. He says the present financial difficulties of the farmers here are no different than elsewhere and that the inhabitants of this valley should realize that they have one of the most promising irrigated tracts to be found anywhere in America.—*Powell Tribune*.

If present negotiations successfully culminate, W. B. Graham, of Byron and formerly of the Service, will realize handsomely on the patent beet topper which he invented and is this year manufacturing for the market.

Mr. Graham has received two offers from Hardy & Hart (Inc.), of New York City, for the patent on his topping machine, and at the present time is considering which of the propositions he will accept, if either of them. The first proposition is an outright purchase of the patent, for which the New York firm is making a bid of \$60,000. The second proposition is on a royalty basis, with a cash bonus of \$20,000, and a guaranteed premium of not less than \$10,000 per year during the life of the patent.—*C. J. B.*

BULLETINS FOR THE FARMER.

Distributed by the Department of Agriculture,
Washington, D. C.

FARMERS' BULLETINS.

- No.
1198. Swarm control.
1217. The green-bug or spring grain-aphis: How to prevent its periodical outbreaks.

There are two kinds of dollars—one that is never worth more than a hundred cents, and one that grows in value. When you put your money in War Savings Stamps you change your hundred-cent dollars into the kind that grow.

LAND OPENINGS ON THE NORTH PLATTE AND SHOSHONE PROJECTS.

DURING July and the early part of August plans were perfected for the opening to entry of some 18,500 acres of public land on the North Platte and Shoshone projects on September 9 and 16, respectively. These areas comprise 203 units on the Fort Laramie Division and 20 units on the Interstate Division of the North Platte project; and 57 units on the Garland and Frannie Divisions of the Shoshone project.

On the basis of information furnished by Project Managers Weiss and Longwell descriptive circulars and maps covering the lands to be opened were prepared by the Washington office for each project. In anticipation of a large number of inquiries concerning the openings there were ordered 45,000 copies of the maps, 28,000 copies of the descriptive circular for the North Platte project, 50,000 copies of water-ental application form for the Fort Laramie lands, 30,000 copies each of the public notice and order relating to the North Platte lands, 32,000 copies of the soldier's affidavit, and 15,000 copies each of the public notice and descriptive circular relating to the Shoshone opening. In addition the North Platte project was furnished 6,000 small envelopes with cards appropriately stamped, to be used at the drawing, and 20,000 manila envelopes to be used in answering inquiries.

In view of the fact that ex-service men have a preference right of entry at these openings, effort was made to bring the openings as widely as possible to the attention of such men. A press bulletin was prepared and sent to 1,719 newspapers in the States of Iowa, Colorado, Nebraska, North and South Dakota, Oklahoma, Minnesota, Kansas, Utah, Montana, and Wyoming, to the large press associations, and to newspapers in the larger cities of other States. In addition the cooperation of the American Legion was requested and cordially given in helping to disseminate information concerning the openings. Letters and a statement were sent by the Washington office to each of the Legion commanders and adjutants in each State, and assistance was given to special news writers in the preparation of articles for publication in the Stars and Stripes, the Army and the Navy Journal, and the American Legion Weekly. Assistance was also given other newspaper writers in the preparation of special articles for their papers. Publicity was also given by the Union Pacific and the Chicago, Burlington & Quincy Railroads. This combined publicity resulted in the receipt of about 8,000 inquiries by the Washington office and the two project offices at the end of the first week in August, and it is believed that many more inquiries will be made than at the openings on these projects last year when over 20,000 inquiries were answered.



SEPTEMBER SUGGESTIONS FOR POULTRY FARMERS.

By H. O. Numbers, Poultry Expert, Loretto, Pa.

IT HAS been very gratifying to receive inquiries in response to our offer of assistance in the August number of the RECORD. The questions and information desired are in line with September management. Mrs. F. E. S., Wilder, Idaho, desired information as to "culling hens, and roosters. Also if line breeding will eventually deteriorate the vitality of a flock." We will comment upon each question severally. We believe that each poultryman employs his own methods; however, there are certain fundamental principles in poultry culture that are incorporated in each one's scheme. We offer you our system. The latter part of September we go through our flocks and weed out all hens in a complete molt. These hens have laid all they will during the season just passed, and will not lay until the next year. We get rid of them at once, as they are high-priced boarders. Last year, by way of experiment, we carried over 115 "September-molt" hens. We gave them good attention, and during March we received 10 per cent eggs from the flock. It cost us \$1.10 per head to prove our theory. If we had marketed these fowls last September we would have been \$126.50 ahead financially. So much for the September molters. A good egg-producing strain will normally lay up to the last of October in a temperate climate. At that time we handle carefully each individual hen. In culling we use a scheme of our own. It will be understood that hens selected by culling are to be used as breeders only, and not for egg production, as our pullets take care of our egg requirements. To be a selected hen, we require at least 3 fingers between the pelvic bones, 3 to 4 fingers capacity; that is, distance between keel or breast bone and vent; bright eyes, good clean combs of fine texture, not too beefy or large in the Leghorns; shanks (legs) free from scale, no crooked toes, no disease nor symptoms. We examine carefully for traces of cold or catarrh, by smelling the birds' breath. As we breed only white fowls, we insist on all white plumage, discarding any with brassy or dark-colored feathers. After our flock is culled, all birds look alike. In uniformity, we also have beauty as well as utility.

To the beginner we suggest that you do not expect to cull your flock as perfectly as the old experienced poultryman. You will add to your knowledge each year by observation and experience. We have known professionals who erred in culling. In this you lay your foundation for success or disaster. Do not be misled by reading too much literature. Some is very misleading.

We select our male birds as follows: From the time the youngster goes out on the range we closely watch for the hardiest, best looking, and best feeder. Any cockerel that outgrows his brothers is leg-banded and held for observation. In the fall we hold over more than twice as many as we will need. In February we select the ones we want to keep. In another article we will describe in detail our method of selecting males for proper matings. One thought we want to impress is, give those cockerels the best possible attention; keep them in perfect health, not too fat. Feed plenty of greens and protein. They represent 50 per cent of your mating hens.

As to line breeding: We do not line breed. Every two years we infuse new blood. We believe that, especially in a small flock, the infusion of new blood from a reliable breeder is advantageous. We use, in some of our pens, male birds for two seasons, with excellent results. In line breeding we are too apt to neglect egg production for type and color, and furthermore it requires a professional to properly conduct a line-bred strain. If you have money to waste, and are anxious to be in the show-bird class, go ahead, but we believe very few have chickens merely as a hobby.

C. H. C., Minatare, Nebr., wants to know "how to caponize, and where to procure the necessary instruments." This is the season to caponize. We have sold all our early broilers; the late ones we caponize because the market has dropped on this product. The heavy breeds make the best capons. We have had some delicious Leghorns that weighed 7 pounds, but it does not pay to bother with the lighter breeds. We will describe our method. The cockerels are penned up for 24 hours without feed or water, so that the bowels

may be perfectly empty. The birds are placed upon the operating table, with legs and wings firmly tied and slightly stretched. We pluck a few feathers over the fourth and fifth rib and moisten with water so as to avoid interference of feathers when the operation proceeds. Have instruments sterilized or free from any bacteria. We use a basin of water with a few grains of potassium permanganate, enough to color the water. Lay your instruments in this solution before and during the operation. We next make the incision. Press firmly upon the ribs, drawing the skin back toward the thigh, and make a cut about three-fourths inch long and deep enough so that the membrane covering the intestines is visible. After the incision has been made insert the spreaders; next use the "pick" instrument to tear the membrane; this will disclose the testicle lying near the backbone in full view. Use the removers and, during extraction, twist; in so doing you tie the connecting cords at each end of the testicle and prevent a hemorrhage. Remove spreaders, and the skin will cover the incision. We never sew up. Repeat the operation on the other side. We briefly discuss the method, as every set of castrating tools has complete instructions for operating. The operation is very simple after a few trials.

These instruments are manufactured by a number of reliable concerns and each one claims to have the best. We are using a combination from three different sets, selecting such tools as are best adapted. Any poultry journal or farm paper contains such advertisements.

The capon in the East excels in flavor any fowl and commands luxurious prices.

A last suggestion: Prevent your early-hatched pullets from molting, if possible, by feeding not too much beef and protein and more solid grains; equal parts of wheat, corn, and oats make an excellent scratch feed. Give them all they will clean up twice daily. Our pullets are laying and we care for them diligently, lest they go into an early molt and shut off our egg supply. This is especially true in Leghorns and lighter breeds.

We again offer our service to you, through the medium of the RECLAMATION RECORD, to assist you in your poultry problems. Address H. O. Numbers, Loretto, Pa.

Marketing Alfalfa from Southwestern Projects.

The irrigated areas of the southwestern United States can produce a high market grade of alfalfa hay, but there are several difficult problems that must be solved in order profitably to market the hay, say specialists of the Bureaus of Markets and Crop Estimates, United States Department of Agriculture.

The first step which has a direct bearing upon the marketing of alfalfa is baling. The rainfall in the

Southwest is exceedingly light during the hay-making season, and for this reason much of the hay is baled out of the windrow or cock.

When hay is baled from the windrow in sufficiently green state to save all the leaves it can not be pressed tightly, because of the danger of heating, and shippers therefore frequently experience considerable difficulty in loading cars with the minimum weight for which they pay charges. Hay which has been stacked and allowed to dry can be baled more compactly, but in baling stack hay many of the leaves shatter because of the dryness. According to the application by many inspectors of the present grade rules, this hay is of a lower grade than when the leaves cling to the stems, notwithstanding the fact that the leaves may be contained in the bale.

Bleached hay, together with weeds, causes considerable trouble in marketing alfalfa. It is well known that alfalfa hay bleaches quickly when exposed to bright sunlight, but there is a wide difference of opinion as to just the amount of nutrient that is lost in bleaching.

Commercial grade rules, however, are based in part upon this factor. Producers and shippers in these sections contend that too much weight is given the color factor in the present commercial grades for alfalfa and not sufficient weight to its feeding value.

From investigations recently made by the Bureau of Markets and Crop Estimates it appears that when the present grading rules are rigidly and technically applied, as is frequently the case on declining markets, it is impossible under the most ideal conditions to produce "choice" grade alfalfa.

The presence of a weed, a blade of grass, or of a bleached stem will prevent a bale from grading "choice," and it is practically impossible to obtain hay which is entirely clear of any of these things. Considerable hay is bought and sold on this grade, however, but the use of it, and sometimes also of the grade No. 1, causes the shipper a heavy loss.

The specialists believe that commercial grades for any kind of hay should be made so that physical limitations in production and preparation will be properly recognized, and that such grades should be uniformly applied, and not influenced whatever by the state of the market.

Most shippers in the irrigated sections seem willing to handle hay at a gross profit of \$1 per ton if the chance of losses on account of rejections could be eliminated. The rejections are almost always based upon the claim that the hay is not up to grade, but occur almost entirely upon a declining market. With only the meager protection against this practice and resultant loss, furnished by inspection services maintained by the trade organizations of the various markets, he is compelled to increase his margin of gross profit to \$2 or \$3 per ton.

When the producer notes the wide difference between the price which he has received for his hay and the price quoted at the adjacent market, he feels that the shipper or dealer is taking advantage of him and is making too large a profit. The producer's desire to share in this supposedly large profit is one of the principal causes of the cooperative wave that is now agitating southwestern alfalfa growers. When this desire is stimulated by an enthusiastic, prospective manager it seems to be not a very difficult matter to form an organization of producers to ship and market hay.

Cooperative market associations can no doubt market their own hay as advantageously as the individual shipper, provided their manager is as well trained and possesses equal experience and business ability, but they are sure to meet the same marketing difficulties, and will have just as many rejections and losses which must be deducted from the proceeds of their sales.

Many of the irrigated sections of the Southwest do not ship more than from 2,000 to 3,000 cars of hay each year and this business is in some instances divided between two or three shippers, who also conduct other businesses in connection, thus greatly reducing overhead expenses. Cooperative shipping associations are being organized in several of these projects. The cure for the present marketing difficulties in the alfalfa sections of the Southwest would seem to be along the line of better standards and their impartial applications, say the marketing specialists.

Chemical Spray to Kill Weeds.

A dispatch from the Boise project states that W. T. McCall, Canyon County Farm Bureau agent, calls attention to the fact that a solution of sodium arsenate of the proper strength will destroy dodder and Canadian thistle.

"A single spraying is sufficient to eradicate the dodder, and in most cases a single spraying is sufficient to eradicate Canadian thistle, although in some cases two sprayings are necessary for the thistle.

"A common knapsack Bordeaux spray outfit is used. The sprayer carries this outfit on his back and sprays the dodder plants where found in the field. This is a much cheaper and more satisfactory manner of eradication than has been followed heretofore.

"Up to this time it has been necessary for those desiring to control dodder to go through the field with a scythe and mow down the plants attacked by the dodder. Later on these plants had to be collected and removed from the field, in most cases, and burned, or else had to be burned where found.

"The sodium arsenite spray is the only method so far discovered with which to successfully combat Canadian thistle. The sodium arsenite comes in solution. One gallon of the mixture is added to 100 gallons of water to make the proper strength solution."

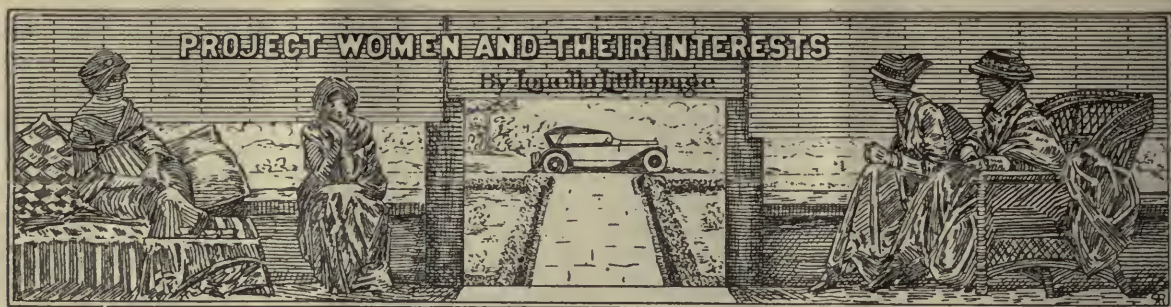
Fighting Hog Cholera with Precautionary Measures.

When hog cholera sweeps through a neighborhood, causing the death of hundreds of animals, a simple precaution, as the proper location of the hog lot, may be the means of preventing infection. Hog lots should be located away from streams and highways. Free range, streams, irrigation canals, etc., help in the spread of cholera outbreaks. Don't visit neighbors' hog lots or allow neighbors to visit yours if they have sick hogs. Infection may be carried by teams and wagons from highways; don't drive into hog lots. Isolate for at least two weeks all new stock hogs and those just returned from exhibitions and sales. Don't borrow or lend hogs for breeding purposes if cholera is in the community.

Burn to ashes or bury 4 feet deep all animals that die on the farm and the unused internal organs of slaughtered animals, since they attract dogs, which may carry infection. If cholera appears in the neighborhood, confine your dog and encourage others to do likewise. Immunize herds located dangerously near infected centers. Careful attention to the feeding and handling of the herd after immunization is an important matter. Mange, lice, and worms lower the vitality of hogs and render them more susceptible to disease.

If cholera appears in the herd, post warning notices so your neighbors will know about it. Have all susceptible hogs immunized at once by some one with special training and experience, preferably a competent veterinarian. Insist that the temperature of all hogs be taken at time of treatment and an increased dose of serum given to those showing a temperature of 104° F., or over. Confine all treated hogs to limited, clean quarters; keep on light, restricted diet for at least two weeks, and give plenty of pure drinking water. Anti-hog-cholera serum is not a cure, but when used as soon as cholera appears in a herd it seems to have a favorable effect on some animals in the very early stage of the disease. Don't rely on serum to cure sick hogs—it is primarily a preventive.

If the disease comes to your farm and runs its course, disinfect thoroughly afterwards all places where sick hogs have been. First, remove all infected manure and spread on fields inaccessible to hogs. Burn all litter, rubbish, and old troughs from infected pens and lots. Turn over portable hog houses, exposing the interior to sunlight. Thoroughly clean pens and buildings in which sick hogs have been kept, and disinfect by spraying with compound cresol solution, 1 part to 30 parts of soft water. In summer, pastures and lots are usually made safe within three weeks by the action of sunlight. Fill, drain, or fence off mud wallows. Disinfect and board up all runs underneath buildings. Destroy hogs that don't fully recover; they may carry cholera infection.



Home, Sweet Home.

IN A cemetery in one of Washington's suburbs there is a grave which is almost a national shrine, for the man whose bones are interred there was the author of "Home, Sweet Home." The name of John Howard Payne is known wherever the English language is spoken, and it will be remembered as long as one American remains on earth. His homely little ballad has no particular merit as either a poetical or musical conception, but deep down in the heart of every human being is a sacred ideal of home.

Too bad that the real thing doesn't always come up to the ideal; that it is common to find a home which is neither sweet nor happy. Is yours? Of course disappointment and bereavement come to everyone sooner or later. Over these things we have no control, and each home has its individual problems, but after all there are only two kinds of troubles—the sort that can be acted upon and dispersed by changing certain conditions, and the other kind that is beyond our power to change. Let us put Owen Wister's motto over our chimney piece: "I am an old man. I have had many troubles. Most of them never happened," then pitch into the things we can control and let tomorrow take care of the rest.

Did you ever hear of Fitzroy Aloysius Jones? Probably not. He lives next door to a certain editor of this city who told me all about him, so I know the story is true. He is 13, the pitcher for the neighborhood baseball team, has carrotty hair and many freckles on his tip-tilted nose. The kids call him "Fits."

When the spring began to stir the fishworms in the warm earth Fits began to beg to go up to grandpa's in the country, but father was obdurate. Fits had to stay in school. Did he sit around and grouch? Did he feel sorry for himself and sulk? I'm wasting perfectly good space to tell you that he did not.

He went to the corner grocer and wheedled him out of a barrel. In every stave of that barrel he bored four holes along its length. They were equidistant, and thus the barrel was but a framework of holes. He lined that barrel bottom and sides with straw, then took his little wagon on Saturday and hauled

load after load of woods earth from a woodland a mile and a half away. In every hole in the sides of that barrel he placed a strawberry plant and on the open top he planted more—120 plants in all. Then he dug a colony of fishworms and put them in also. He said they would keep the earth stirred up in a way useful for both drainage and irrigation.

Every afternoon Fits sprayed the barrel gently with the hose, and every morning he turned it around so that each side would get the sun. That's all, except that he supplied the family with the finest berries you ever saw and sold them to father for top prices.

Whenever you get sorry for yourself and feel that conditions are hopeless remember Fits. He wanted to farm. He had no place to do it in except a back yard about as big as a prayer rug, and that was concrete. In his own words, it was a "rotten prospect," but that didn't stop Fits, because instead of sitting on the back steps and worrying about what a hard life his father made him lead, or grouching around, he got busy. Every time his editor neighbor goes out on his back steps he laughs at himself. Every time he sees that barrel he discounts the little poem about opportunity knocking but once at the door and never coming back unless some one answers the bell. The worthwhile things of life grow out of necessities, and it may be that the difficulties in our home life are opportunities for us to grow if we are really worth while.

There is a strange tendency in most of us to keep our good manners for acquaintances and strangers and to display our irritability and selfishness in the home circle. Of course, home should be a place where we feel free from restraint, where we can say what we really think and do what we want to do, but isn't it strange we should ever want to say or do what will hurt or annoy those whom we love best? If there is discord in your home, maybe you have been overexercising this tendency.

Parents should not hesitate to correct children's faults or refuse them pleasures which would be harmful to them, but it is a rare home indeed where children are taught politeness and forbearance by example. We should at least be as courteous to our

little children whose training is in our hands as we are to the stranger or friend who may be with us for a moment and then pass out of our life.

Another thing which grown-up members of any home should cultivate is the gentle art of letting each other alone. You may love the members of your family devotedly; you may be willing and ready at all times to sacrifice your own comfort and pleasure for them, but if your love is unreasonable or exacting, if you nag and criticize and interfere in things which really do not matter one way or the other, you need search no further for the discordant note.

It is not reasonable to expect nor is it necessary that all should have the same tastes, care for the same books or amusements, or choose the same friends. But each should respect the other's right to choose for himself.

Don't worry. At least, if you must stew, don't boil over and make everyone else miserable. The way some people anticipate trouble you might suppose worry a sure cure for it. As a matter of fact, worry is of no more value than trying to get rid of roaches by making faces at them. It is egotistical and heathenish to worry. The seasons, the weather, the crops, and other manifestations of nature are not in our hands, and the Supreme Teacher of the ages said "Be not afraid."

Nine times out of ten when a member of a family suffers from the discord he is to blame, and, like Fitts, the remedy for the unhappiness lies within himself. We have only one little day to live at a time—just a few hours in which to enjoy our blessings and to exercise the same courtesy and self-control we want others to show to us. It soon becomes a habit which pays a thousandfold in happiness, and it pays upon delivery.

"This little strip of light
Twixt night and night
Let me keep bright
To-day!

And let no shadow of to-morrow,
No sorrow from dead yesterday gainsay
My happiness
To-day!

Then, if to-morrow shall be sad,
Or never come at all, I've had
At least

To-day!"

What Every Project Should Have.

Glendive, Mont., at the lower end of the Lower Yellowstone project, is showing the world what a little "pep" and enthusiasm can accomplish. During the recent heated period some one conceived the idea that a public swimming pool would be a desirable addition to their city, and on July 29 a mass meeting was held in the rooms of the chamber of commerce to determine whether such a pool was wanted and to devise ways and means for securing it.

Little time was wasted on preliminaries. As soon as the purpose of the gathering was explained those present unanimously voiced their sentiments in favor of the best kind of a swimming pool that could be constructed. It was also decided to build the structure by volunteer effort rather than by the creation of a park district and the sale of bonds. Everyone wanted the pool at once, so committees were appointed and the meeting resolved itself into a donation party. The Northern Pacific Railway donated sand and gravel. Others offered trucks, wagons, men, cement, engineering service, piping, and valves. Subscription blanks were quickly devised and filled out. Before the meeting adjourned, and within an hour and a half after it opened, the project was assured and in such shape that work could be commenced at once. The next afternoon the committees decided on the type of pool, and within 36 hours after the mass meeting the work of construction was commenced and pushed to the limit. The Eastern Montana Light Co. strung wires and furnished lights so that there would be no delay.

There is every indication at this writing that the pool will be completed by August 15, when appropriate dedication exercises will be held.

This will be the largest swimming pool in Montana. It is circular and 150 feet in diameter. It runs from nothing at its perimeter to 8 feet in depth. The city is wildly enthusiastic and everyone is wielding a shovel, running a tractor, directing a fresno, or doing his share in some way to help the work along. Springboards and other equipment will be provided. The pool is located in Lloyd Park, adjoins the free tourist camp, and will be available to autoists as well as local residents. No fee will be charged for the use of this pool, the city government bearing the cost of maintenance. City water will be employed, thus insuring clean, wholesome water.

Plans are being worked out to provide a lily pond and fountain near the pool and on ground somewhat lower than the elevation of the pool. The overflow water will be used for this purpose. A Japanese garden will also be constructed at another lower elevation.

Here is something the women can do. Local organizations will be willing to take hold of such a project, and with pools in the various project towns a splendid, healthful, and enjoyable recreation spot can be made available for every settler on the Government farms as well as the town residents.

Your Perennial Garden.

Fall is the time to plant flowering bulbs for a profusion of spring flowers, and iris, peonies, lilies, and shrubs which blossom in early spring should be planted in the autumn, just what time depends upon the latitude.

The tulip and narcissus in numberless variety are easily grown by the amateur. These bulbs should be planted in light, rich soil that has been loosened up

at least 10 inches deep. The tulips should be set 5 inches apart and 4 deep, and narcissus bulbs 10 inches apart and 5 inches deep. They should be planted not too long before the ground is frozen.

In the late fall and early winter months it is well to cover the beds with a light mulch of straw or leaves, and this mulch should be removed in the spring as soon as the growth appears above the ground. These bulbs are quite hardy and not easily injured by frost if the ground is well drained. They will increase in number for about three years before they need separating, then after blossoming in the spring six to eight weeks should elapse to allow the foliage to die down, when the bulbs may be lifted with a spade or fork. Shake soil from the roots and store the bulbs in a cool, shady place where they will ripen. Plant again in the fall, and in this way the stock is increased and preserved.

In many of the old English homes narcissus planted over half a century ago is still growing and blooming vigorously.

Don't get discouraged when your expensive pearl buttons lose their luster. Just a little labor will brighten them up as good as new. Soak the buttons in olive oil or a good quality of machine oil. When you take them out rub them hard with powdered pumice, talcum powder, or a good nail polish. The nail polish should always be used to finish them up with, and they will shine like well-manicured nails. Cut jet buttons should be scrubbed with a toothbrush and good soapsuds, and steel and other buttons are often improved by this method. It is too much work for the busy housewife on the farm to remove pearl buttons from skirts or other garments when washed, and they are bound to lose their luster eventually, but a little manicuring will renew them completely.

A piece of rubber tubing will be found a most desirable addition to the kitchen equipment, especially if you have running water. A piece three-quarters of an inch in diameter will fit over the faucet in the sink, and it will be easy enough to siphon the water into the wash boiler on the back of the stove, thus eliminating many trips and the lifting of heavy bucketfuls of water. The water can be siphoned from the boiler to tubs, or from boiler or tubs to the sink. The tube must of course first be filled with water, and a thumb placed tightly over each end of the tubing to prevent the intake of air. Many other uses will be found for it once the tubing is tried out.

It is not too often to repeat the axiom every month, that in order to nourish the body properly we must breathe pure air, eat plain natural foods, exercise our muscles every day, and get a certain amount of quiet, refreshing sleep.

Raising Game Birds on the Farm.

PHEASANTS.

Considerable interest has been aroused by a suggestion in the June RECORD that women might find it profitable to raise game birds in a small way for commercial purposes.

Experiments in game breeding have been carried on by various States and associations for a number of years, and some interesting information has been collected by the Bureau of Biological Survey on the raising of quail and wild ducks which will be published later.

The game birds which are most likely to be raised successfully are ring-necked pheasants, mallards, and wood ducks, all of which breed readily in captivity. The propagation of quail is still largely in the experimental state and success is more difficult.

The American Game Protective Association, New York City, has published a book by E. A. Quarles on "American Pheasant Breeding and Shooting," in which the author keeps in mind particularly the small breeder—the farmer's wife with a desire for more pin money, or the man with a few acres which he cares to devote to recreation. The book treats the subject in a comprehensive, sequential, and detailed manner, instructing the breeder in every detail, from procuring a State license to preparing the pheasant for the table or for the market.

It is claimed that pheasants are more successfully raised to date than any other game bird; they mature rapidly, and it costs less to feed and little more in care to produce 50 to 100 birds than the same number of chickens, yet retail dealers pay from \$3.50 up a pair for eating purposes in eastern markets during the season, which runs from October to May. The breeder can count pretty surely on securing at least \$5 a pair for the birds for breeding purposes, or \$3 for a hen, and the demand for breeders frequently exceeds the supply.

One handicap to this work is the fact that many States have laws which forbid the importation of hand-reared birds from other States for the purposes of consumption. This will hardly affect the small individual pheasant farmer, however, as most States will readily consume all the birds which are raised locally. Ring-necked pheasants have also been found to withstand the cold climate of our Northern States remarkably well.

The first step in pheasant breeding is to procure a license, which is required in the more progressive game-breeding States, and this license carries with it authority to also sell birds, whether alive or dead, with certain restrictions.

The field must consist of well-drained soil of sufficient fertility to grow cover crops, and running water in the form of a stream or through troughs must be afforded.

It is advisable to start with birds rather than eggs, although the latter plan may be followed. In some States the birds in very limited number are furnished gratis, but in this event they can not be confined and hence will be useless for profit or breeding purposes. The birds should be purchased in the fall or early winter, one cock to four or five hens. This will admit of their becoming thoroughly settled before the breeding season, and they are much more likely to lay well than birds shipped later. Five hens should lay at least 100 eggs during the season; 2 or 3 year old birds are preferred; and it is conservative to expect to raise 12 birds to each hen.

A very satisfactory movable pen has been found on the New York State game farms to be 12 by 14 by 6 feet, covered on top and sides with 2-inch poultry netting, and built on runners. This gives nearly 40 square feet to each of the five birds. It costs approximately \$8 to build. In moving these pens one is boarded over at the bottom and all the birds driven into it. The wire must be put on loosely to minimize the chances of the birds becoming alarmed and flying against the wire to their injury. Stationary pens are employed on the New Jersey farms, built end to end so that the birds may be driven from one to another. Boards or burlap should be fastened to a height of about 3 feet at the bottom to prevent disturbing the birds by dogs or passers-by.

But whatever type of pen is used, it should contain cover for hiding and laying; roosts 2 or 3 feet from the ground, which should be removed during the laying season; a simple shelter open in front, with back to prevailing winds, and doors with lower edges 10 or 12 inches from the ground to prevent ingress of dogs and vermin. An elaborate pen is not necessary, and any stationary pen affording 75 square feet to each bird will do, providing the soil is kept fresh from year to year by spading, liming, and the sowing of rye, clover, or other purifying crops, and only an occasional change in location.

Pheasants need grit and charcoal and a good supply of pure water. They can bear a great deal more cold than the domestic fowls and consequently need and will thrive better with much less shelter, a few evergreens being all that is absolutely necessary.

In ordering be sure to specify that the long feathers of one wing be clipped. Provide pen before their arrival, with scratch food (mixed grains from any poultry supply house) charcoal, grit, water, dusting facilities, and covering of evergreens or brush. Place shipping crate within the pen and provide an opening barely sufficient for the exit of the birds. Then retire and keep away from the pen until the birds are a little accustomed to their surroundings.

For winter feeding, bed your pen fairly deep with leaves or straw in one corner. Throw wheat, corn, or

any regular scratch food on the leaves or straw. Two light grain feeds a day are sufficient. Mangels or beets of any kind, turnips, lettuce, and other succulent foods should be given. It is well to hang this feed on a string, so that they will have to jump for it. Be sure to provide a hiding place. A pole 4 or 5 feet long placed 2 or 3 feet from the ground and covered with evergreens or brush will do.

They begin laying the latter part of March or in April as a rule. The feeding of a special laying ration will increase egg production, but green food and charcoal and grit must always be given. Eggs should be gathered twice daily, placed in tray of oats or bran and turned twice a day. The eggs should be "set" for best results when not more than 10 days old. Pheasant hens in captivity will not sit, and so domestic hens must be employed. Bantam hens are considered ideal foster mothers. Incubators are not recommended and pheasant chicks will not hover in brooders. Never employ a hen with feathers on her legs or one afflicted with scaly leg. Hen and coop should be kept free from pests.

The rearing field for small breeding may be an orchard or garden. A strip of corn sowed thickly across the rearing field affords shade and protection from birds of prey. A strip of buckwheat is likewise valuable.

Chopped hard boiled eggs mixed with cracker dust is a good feed for four or five days. Mix until dry and crumbly. No water is given the chicks for four or five days. After a week the hen and chicks are given free range from the coop. A diseased chick must be killed and burned.

On the California State game farm they are rearing and liberating only Chinese pheasants, and the same is true in other of the Western States, and near Seattle, Wash., the Prince of Wales is raised. But there is practically no difference in the methods of raising. Your State game warden can give you information desired.

The price list of a well-known dealer quoted pheasant eggs from \$3 to \$80 per dozen, and the birds by the pair at from \$6 to \$100 per pair.

When the farmer's wife awakens to the fact that a few ringnecks reared each year will produce more pin money than chickens, guineas, or turkeys, with hardly any more trouble involved in bringing them to maturity, she will forsake some of the other fowls and add ringnecks to her list.

RECENT PUBLICATIONS ON THE PROPAGATION OF GAME BIRDS.

[List supplied by the United States Department of Agriculture, Bureau of Biological Survey, Washington, D. C.]
Hornaday, W. T., and Crandall, Lee S. Breeding mallard ducks for profit. New York State Conservation Department, Albany. 1912. Free.

Huntington, D. W. Our wild fowl and waders. Amateur Sportsman Co., New York City. 1910. \$2.
 Job, H. K. Propagation of upland game birds. Bulletin No. 2, April, 1915. 25 cents. The propagation of wild birds. 1915. \$2.15. Both published by National Association of Audubon Societies, 1974 Broadway, New York City.
 Quarles, E. A. Bob-white: His breeding, protection, and increase. 1915. 25 cents. The mallard: Its breeding, shooting, and preserving. 1916. 25 cents. American pheasant breeding and shooting. 1916. Paper, 75 cents;

cloth, \$1. The breeding of the beautiful wood duck. 1916. 25 cents. Breeding the wild turkey. 1918. 25 cents. All published by American Game Protective Association, 233 Broadway, New York City.
 Roess, A. Pheasant culture. Michigan Game, Fish, and Forest Fire Department, Lansing. 1919. Free.
 Simpson, G. M. Pheasant farming. Bulletin No. 2, Oregon Fish and Game Commission, Portland. 1914. 50 cents.
 —L. L.

THE VALLEYS OF ELEPHANT BUTTE.

Where Wealth is Garnered from a Fertile Soil and Country Life Has Become Citified.

THE West of to-day calls as strongly as it did years ago when Horace Greeley made famous the words, "Go West, young man." The West, and especially the Southwest, is still the land of the pioneer. Vast natural resources are just beginning to be developed. New oil and gas fields are being discovered every month. The great coal fields of northern New Mexico have only been scratched. Engineers are still making reconnaissance of the gigantic hydroelectric power possibilities of the western rivers. And millions of acres of land in the arid regions are still waiting for the United States Government to impound the flood waters of the many streams and divert them to the fertile virgin soil of the desert. These are the opportunities for irrigation and with them will go the development of mines, forests, and plains, and the building of towns, railways, and highways.

To be sure, opportunities exist all over the country for those who will apply intelligent effort, but where are the gifts of nature so numerous as in the Southwest, and where so little developed? Imagine a river valley in southern New Mexico and western Texas of rich alluvial soil extending from the famous Elephant Butte Reservoir south to 50 miles below the city of El Paso. It is an artery of verdure, here and there passing at the foot of the secondary ranges of the Rockies, multicolored and treeless, at other times bordered by the mesa, a part of the great American plains with just enough grass for grazing. This green strip constitutes the Rio Grande project. Through its entire length are one to three of our transcontinental railroads and all the way there are fine highways, 65 miles of which are of the best concrete or bituminous construction, with 35 miles more now being built.

Already there are many villages, fine farms, and beautiful homes. In the midst is the agricultural college of New Mexico and at El Paso, the metropolis, located at the center of the project, are all the attractions of a beautiful, modern, enterprising city.

The project is just being completed. It consists of the famous storage reservoir, a complete irrigation system delivering irrigation water to the individual

farm, and a drainage system with two years' work yet required for its completion. The system is designed to irrigate 155,000 acres, excluding 25,000 in Mexico; only one-half is now cultivated. This 75,000 acres of undeveloped land in the project must go under the plow. There are not enough farmers here to do it. In fact, a large part of the land already cultivated does not do justice to itself because of the lack of farmers and good methods. All of this irrigated land is adaptable to the most intensive cultivation and there is a local market to consume the crops. At the present time this land can be purchased for attractive prices and on very easy terms.

LOCATION AND CLIMATE.

This country is a delightful one in which to live. There is an abundance of sunshine; it has a beauty, grandeur, and bigness that takes root in your very blood, and an exceptionally fine all-year climate. Its location is on the table-lands of the great continental plateau, about 600 miles from both the Pacific coast and the Gulf of Mexico; it is on the thirty-second degree north latitude and has an elevation of about 3,700 feet. The average rainfall is 9½ inches a year. It is the small rainfall and high altitude that makes the climate so delightful and healthful.

The winters in El Paso are mild, and during this season the farmer can do all his spring plowing. Stock can be pastured out the winter through. The growing season in El Paso averages 250 days. The average for the last eight years in El Paso of the last killing frost in spring was on March 19, last light frost April 8, first light frost in fall, November 7, and first killing frost November 23.

GENERAL FACTS ABOUT THE RIO GRANDE PROJECT.

In the United States during the last 20 years the Federal Government has been constructing great storage reservoirs in the large rivers of the arid West, and developing vast irrigation systems for reclaiming the tributary lands. To date, there are 25 projects either completed or in process of construction. The Rio Grande project is one of the largest. The water

supply is from the Rio Grande, the historical river that rises in Colorado and Wyoming and in the center of the Nation and flows south to El Paso, thence to the Gulf of Mexico, and forms the boundary between Mexico and the United States.

The irrigation system consists of the Elephant Butte Reservoir, which has a storage capacity enough to cover 2,700,000 acres of land a foot deep with water. The dam is located at a point about 100 miles north of El Paso. The irrigable land constituting the project lies in the river valley, a narrow strip a few miles wide extending from about 75 miles north of El Paso to about 50 miles south.

The distribution system consists of three diversion dams that turn the controlled flow of the river into the canals; 53 miles of main canals, 162 miles of lateral, and 184 miles of sublateral; the drainage system will comprise 330 miles of deep open drains, aggregating fifteen and a half million cubic yards of excavations. The total cost of construction and right of way, including storage, to date, is approximately \$10,750,000.

ATTRACTIONS OF IRRIGATION FARMING.

Farming by irrigation is the ideal method. It makes farming one step nearer a real science for it lessens the uncertainties of a moisture supply to a minimum. The question of adequacy of water supply, the prime factor, is based upon long and exhaustive hydrographic studies. The relation of the project areas to the available water supply is arrived at after extensive studies of the duty of water and seepage losses. Irrigation dams and structures are built to last. The Rio Grande project in many of its features is one of the famous monuments in irrigation engineering. Besides the great size of dam and reservoir, the drainage system which is being developed is the most extensive yet undertaken in any irrigation project; it is the outgrowth of the recognized need that the increased water logging in nearly all great projects has brought about.

Irrigation farming is especially attractive to the young man. It involves many different practices that farming by rain does not require, but the greater possibilities and security make it an attractive proposition.

In the Rio Grande project the long season and the big list of crops will appeal to the northern irrigation farmer. Five cuttings of alfalfa are possible. Practically any crop that will grow in the Southern States, except Florida, as well as the Northern States crops, will grow here. Yet the summers are mild because of the altitude, and one does not suffer from the heat.

CROPS, FINANCIAL RETURNS, ETC.

The opportunities for a farmer on this project depend only upon his experience and his willingness to

work. The soil and climate here will grow in profusion any Temperate Zone crop. That part of this project already in cultivation has produced good profitable returns; on 77,880 acres cropped in 1920, \$4,639,200 of crops were produced, representing \$50.60 an acre as an average. This is a fair return on the investment, but it does not represent the possibilities that might be realized, for the reason that the relatively few farmers occupying this great area are content to cultivate the more easily grown staples, as alfalfa, cotton, corn, and wheat, in which large acreage can be cultivated with little work and relatively small returns. In 1920 the average value per acre of such crops was as follows: Alfalfa, \$70.11; cotton, \$71.52; corn, \$29.46; wheat, \$45.72. The intensive cultivation of special crops brings much larger profits to the farmer, as shown by the accompanying table:

Total acreage in special crops, 1920.

	Acre.	Value.	Value per acre.
Cabbage.....	119	\$35,392	\$297
Chili pepper.....	20	2,907	145
Flowers.....	8	15,969	1,996
Onions.....	131	24,727	189
Pears.....	576	88,015	153
Sweet potatoes.....	365	45,155	124
Tomatoes.....	30	4,340	145

Exceptional yields and returns are reported by different individual farms, showing what can be expected from the best methods by those who will develop small areas in garden products. Individual yields are as follows:

Crop.	Yield.	Unit of yield.	Value per acre.
Sweet potatoes.....	500	Bushels.....	\$855.00
Peaches.....	20,000	Pounds.....	1,120.00
Pears.....	17,500	do.....	700.00
Cantaloupes.....	666	Crates.....	366.00
Cabbage.....	32	Tons.....	640.00
Flowers.....			1,996.00
Celery.....			1,200.00
Onions.....			1,140.70

FARM DEVELOPMENT OPPORTUNITIES, MARKETS, AND MARKETING FACILITIES.

Exceptional opportunities are offered in the Rio Grande project for live, capable farmers. The character of soil, market needs, irrigation facilities, all make intensive cultivation attractive. At the present time most of the farmers are content to grow the more easily grown staples of alfalfa, corn, and wheat. As a consequence the city of El Paso, with a population of 90,000, has to import about three-fourths of its fresh vegetables, fruit, poultry, and dairy products from California or east Texas, 600 to 1,000 miles away. All these products, of the best quality, can be

grown here. In the last three years cantaloupes and cabbage have become popular crops. The quality is splendid and they were grown in quantities and shipped out of the project. On the other hand, there has never been a well-balanced production of crops in relation to local market needs. All kinds of deciduous fruit do very well, especially Bartlett pears, peaches, and grapes. There are 900 acres now planted to pear orchards and the acreage is increasing yearly. There are very few grapes grown, although what there are have sold readily to city autoists right at the farms. Grapes of the same kind and quality are shipped in from California, and last year retailed for 20 to 40 cents a pound, depending upon the time of the year.

Although alfalfa is the principal crop at present and in 1920 it is estimated that 4,000 carloads were shipped outside of the project, yet in the whole area there are only 4,200 dairy cows. These have to supply the 90,000 urban population and 25,000 population of farms and villages with fresh milk, which means a supply of only a little more than one-half pint a person a day. There are no creameries making butter or cheese in the whole project. Much evaporated and powdered milk is used in homes and factories. Also large quantities of fresh cream and butter, which is homogenized, is imported for ice-cream manufacture.

The first-class railroad-train service on four trunk lines makes marketing prompt and easy to any part of the United States. The good roads throughout the project and over them a number of auto freight lines facilitate the marketing of farm products to El Paso.

There are a number of strong, cooperative farmers' associations of service to farmers. There are two farm bureaus in the project—the Dona Ana County (N. Mex.) Farm Bureau with headquarters at Las Cruces, under the direction of Mr. J. B. Petersen, county agent, and the El Paso County Farm Bureau, H. C. Stewart, county agent, which is affiliated with the El Paso Chamber of Commerce. These associations are very active in improving farm methods and promoting cooperative effort. As a part of this work the home demonstration department and a league of women's clubs is doing fine work. Besides this there is a Bartlett Pear Growers' Association. The dairying association to date takes in only the Mexico part of the project, but the farm bureaus are, at the present time, extending it to cover the whole project. They are also organizing the alfalfa growers' association that will market at least 75 per cent of all the alfalfa sold.

FARM OPERATING CONDITIONS AND COSTS.

Where can a farmer find all conditions right for doing real things in a sure and certain way at so small an operating cost? In a reclamation project the Government asks the owners to pay back only what

the work costs without a cent of interest, which is, in the case of the Rio Grande project, about \$90 an acre. The Government gives the project 20 years to pay it. This is equivalent to less than the interest that a private project would require with the principal to pay in addition, the same as a gift of so much by the Government to the people. Operation and maintenance, as it is now furnished by the Reclamation Service, is paid at the end of the year by the farmers, a service under the direction of the most competent engineers. Here also there is no interest charge for operating expenses. The rate is on the basis of amount of water used. In 1920 the charge was \$1.75 per acre, minimum charge for the first 2 acre-feet; \$1 for the third acre-foot; and \$1.25 for each acre-foot in excess of 3 acre-feet. There is also a reservoir charge of 50 cents per irrigated acre. During the year 1920 the average application of water amounted to 2.95 acre-feet per acre.

A very important item that enters into the practical farm operation is the supply of farm labor. In this respect there is no place in the United States where the situation for labor supply is better. In the vicinity of El Paso there has always been an abundance of Mexican laborers. They are procurable at rates much lower than anywhere away from the Mexican border. Farmers in the El Paso Valley last year paid \$1.50 a day. Labor in the city of El Paso cost about 50 cents a day more. At the present time the rate in El Paso is \$1.50, and \$1 to \$1.25 a day is the prevalent rate on the farms. Mexican laborers when handled right are as good as any common labor that has been available in other parts of the United States. Large employers of Mexican labor in El Paso and the Southwest, representing a number of different industries, have written very high appraisals of them to the chamber of commerce. For the best results an elementary knowledge of Spanish is necessary, but this is something that a young man can acquire in a very short time.

SIGNIFICANCE OF EL PASO TO THE RIO GRANDE PROJECT.

The growth of El Paso and the development of the great Southwest spells enhancement of value to farm property. The city and the project are inseparately linked together.

El Paso is a rapidly growing, flourishing city with economic advantages that prophesy its growth into a great city of the future. It is a rare privilege and opportunity to live in a farm community near such a city. It affords all the opportunities for the educational, religious, musical, artistic life, and entertainment to which all people aspire. It affords the very unusual combination of the new undeveloped land of opportunities and esthetic possibilities of a metropolis. Facts about the city and the territory of which it is the center are herewith mentioned.

NATURE OF FARM PROPOSITIONS FOR NEW SETTLERS.

As stated before, there are about 75,000 acres of land never yet cultivated, which the Rio Grande project is ready to supply with water. This land is all privately owned, as is practically all the property in the entire project. A part of this has not yet been drained—awaiting the completion of the drainage system.

The undeveloped land is located in tracts throughout the entire length of the project. It is of various qualities. Some small part of it has been water-logged and will need to be aerated and washed; however, this area is small. The great percentage is a fine, sandy loam, that needs only to clear the brush, level, and plow and ditch. It is in tracts from a few acres to blocks of several thousand acres in size. Undeveloped tracts can be bought for prices from \$50 to \$150, depending upon their location.

An idea of the possibilities of increase in value of the project land can be judged by the fact that in the past year several sales of highly developed orchards and garden tracts within a radius of 10 miles of the

city sold for prices from \$650 to \$1,200 an acre. In this connection, there are many improved or partly improved farms devoted to general farming that could be put to specialized crops or operated in intensive farming on a more profitable basis; many of these developed farms or subdivisions can be procured at attractive prices and terms.

The general situation here of land ownership by non-resident owners, which has resulted generally here as everywhere in small profit and much grief, makes opportunities at the present time especially numerous. In addition to this, the near advent of the completion of all construction work and the consequent first year's levy of construction charge by the Government make it urgent that owners of undeveloped land sell out. As a service to prospective settlers and buyers in selecting farm tracts, a list of all tracts for sale and their prices and terms has been prepared. Professional engineering and agricultural advice as to possibilities and procedure is afforded by the El Paso County Farm Bureau, working in cooperation with the irrigation district organizations and the Reclamation Service of the United States.

REGULATING OUTLET VALVES FOR STORAGE RESERVOIRS.

By J. M. Gaylord, Electrical Engineer, U. S. R. S.

THE Service requirements of outlet valves for reservoirs are much more severe than those of ordinary valves installed in water conduits. For the latter class of service, standard gate valves are usually sufficient, but at reservoirs heavier construction and special valves are necessary for proper regulation of the flow. This is due to the larger quantities of water to be handled and the fact that the water is discharged into the air and the full pressure of the reservoir is effective in forcing the water through the valve and must be dealt with in the operation of the valve. All of the potential energy of the water is converted into kinetic energy upon discharge, resulting in high velocity and the development of power. There is little practical difficulty in handling small quantities under high head or large quantities under low head, but where both quantity and head are high, as is the case at most large reservoirs, the problem takes on a more serious aspect.

Exact regulation and constant flow are required to meet the demands of irrigation or power, and this means that the regulating devices must be capable of delivering any amount up to the maximum and must remain in any position when once set.

Standard gate valves are not well adapted to free discharge because of the imperfect guiding of the gate leaf, which results in difficult operation and chattering and eventual destruction of the leaf when operated under heads above a very moderate limit. It is the practice of the Reclamation Service to limit the use of

gate valves to installation in conduits, and in rare instances for free discharge under heads below 25 feet.

The rectangular sliding gate is the ordinary form of outlet where large quantities of water are required and where the head is low or moderate. These gates are simple, moderate in cost, and have given satisfactory regulating service in sizes as large as 8 feet by 12 feet under heads of 50 feet. Attempts to use this form of gate at partial openings under higher heads have usually proven disastrous, although as a rule the outlet works below the gates have suffered more than the gates themselves. At Pathfinder and Shoshone Dams sliding gates 44 inches wide by 77 inches high gave unsatisfactory results under heads above 100 feet, and at Elephant Butte Dam gates 47 by 60 inches damaged the outlet passages when operated wide open under a head of about 100 feet.

The damage is by no means entirely due to silt or extraneous materials, although these are important factors in some instances. The principal cause seems to be the churning and turmoil of the water and the formation of partial vacuums at certain points by the high velocity of the jet. The passages can not be shaped to conform exactly to the natural shape of the stream, and if the shape conforms approximately for one discharge it may be entirely incorrect for another condition, and cavitation of the material of the outlet results.

In most sliding gate installations it is impossible to equalize the pressure on the two sides of the gate,

and it is, therefore, necessary to provide operating gear sufficiently powerful to move the gate against a heavy friction load. For large and high head gates the operating gear becomes very heavy and cumbersome and power-operated stands are essential. Motor-operated lifting devices are desirable within certain limits, but for very heavy loads the limitations of thrust bearings and gear reductions make the hydraulic cylinder preferable. Any form of power stand requires a source of power which adds to the complications and cost.

As previously mentioned the jets of water issuing through the outlet works represent power, and at some of the larger dams, such as Arrowrock, Pathfinder, Elephant Butte, and Roosevelt, tens and even hundreds of thousands of horsepower are wasted by the discharge of water at the peak of the irrigation demand. When not applied to some useful purpose this energy is all transformed into heat. If the outlet works are inefficient, a considerable portion of this energy is absorbed within the structures and serious damage is liable to result. If the jets are allowed to impinge on the dam or tunnel linings portions of the structure are likely to be destroyed. It is, therefore, necessary to provide means of getting rid of this energy without injury to the works.

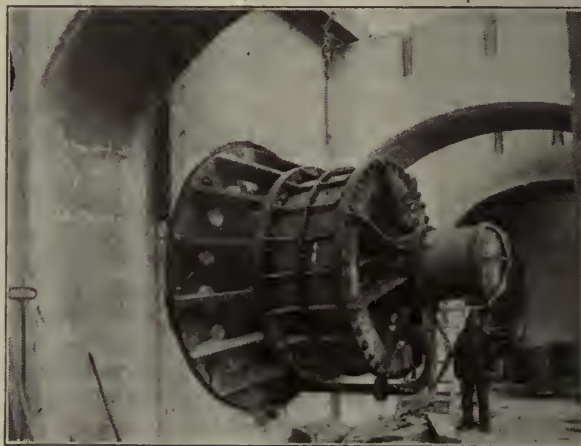
One method is to design the outlet works to cause approximately complete dissipation of the energy within the structure, and this can be accomplished successfully where the amount of power involved is not too great.

The cylinder involves the principle of dissipation of energy within the gate structure itself. This gate consists essentially of a hollow cylinder arranged for vertical motion parallel with its axis to control radial openings in a cylindrical tower receiving water from the outside and discharging it through the hollow center which is connected to a suitable outlet conduit. The water pressure has equal access to the entire outside surface of the cylinder, and hence water load such as occurs in the sliding gate is eliminated. In other words, the cylinder is a balanced gate and the operating mechanism is required to lift only the weight of the moving parts. Water passes radially inward through openings in the tower walls and the jets being diametrically opposed impinge on one another, dissipating practically all of the energy.

The cylinder gate has large capacity for its cost and is well adapted for moderate heads from 25 to 75, or possibly 100 feet. Two cylinder gates 8 feet 6 inches in diameter are in successful operation at Lahontan Dam under heads up to 100 feet. The Sherburne Lakes Dam and Keechelus Dam are both equipped with cylinder gates 12 feet in diameter. The maximum operating head at Keechelus is 73 feet and at Sherburne 50 feet. At McDonald Reservoir on the Flathead project cylinder gates 7 feet 6 inches in diameter are operating successfully under heads up to 65 feet. In cylinder gate installation it is desirable

to provide means of shutting the water out of the gate structure for inspection and possible repairs, and usually this is accomplished by plain sliding gates in the water passages leading to the cylinder gate.

Sliding gates and cylinder gates are adequate for the control of the smaller reservoirs, but at the larger dams both the discharge and the head are greater and it is necessary to employ an entirely different type of outlet. The needle valve is the only device which has proven satisfactory for free discharge under heads above 75 feet. This term is applied to any valve having a circular orifice closed by a cylindrical plug with a pointed end. Such valves are familiar in water-wheel practice where they have been used for many years under heads of 2,000 feet and more. The severe requirements of power service have resulted in the development of a device of simple, rugged design and maximum efficiency.



Balanced valve, Arrowrock Dam, completely installed. Piston in closed position.

In designing needle valves for irrigation service, great stress is laid on obtaining a device which will produce a smooth jet and leave a maximum of power in the stream. This is quite the reverse of the main object in the design of the cylinder gate where most of the power is dissipated within the gate. The needle valve readily lends itself to this main objective and has the further advantage that the needle is naturally balanced laterally by the equal water pressures on all sides, and its axial motion can be readily controlled by making its upstream end the piston in a close-fitting cylinder and balancing or unbalancing the hydraulic forces by a simple control of the pressure in this cylinder. The feature has led to the general use of the term "balanced valve" as applied to the valves in general use by the Reclamation Service.

The first balanced valve was tested at Roosevelt Dam in 1906 by its inventor, O. H. Ensign, and the

results were so satisfactory that working installations were made in rapid succession at Roosevelt, Pathfinder, Belle Fourche, Arrowrock, and Shoshone Dams.

In many of these installations the valve is mounted on the water face of the dam, discharging into a conduit through the structure and is submerged when in operation. A control pipe leads from the cylinder to a convenient location, and operation is by means of a simple hand-operated control valve, reservoir pressure furnishing the power for moving the plunger. This arrangement, although simple, cheap, and effective, is open to the serious objection at hold-over reservoirs that the device can not be inspected or repaired without emptying the reservoir.

The later installations have been designed to avoid this objection by placing the valves below the dam at the end of pipes and providing emergency stop valves above the regulating valves to shut off the water for inspection. The operating principles of the first Ensign valves have been retained in the later installations. Another important advantage secured by installing the regulating valves below the dam is the safety of the outlet conduits. Practically all of the power of the jet is passed on and spends itself below the structures where no serious damage can be done. The cost of this type of outlet is, of course, greater than for the Arrowrock type, but the additional expense is justified by the advantages secured.

JACKSON LAKE RESERVOIR.

By Barry Dibble, Project Manager, Minidoka Project, Idaho.

I N 1921, for the first time, Jackson Lake Reservoir in Wyoming has been filled to its designed capacity of 847,000 acre-feet. This reservoir was originally designed to take care of the requirements of the Minidoka project in Idaho. A temporary dam was constructed in Snake River at the outlet of Jackson Lake Reservoir in 1907. Work on a permanent dam to hold the water surface at elevation 6,752 was begun in 1910 and completed in 1911. The reservoir at that time had a capacity of 380,000 acre-feet. On February 25, 1913, the United States entered into a contract with the Kuhn Irrigation & Canal Co. and the Twin Falls Canal Co. by which these companies were to furnish the money for increasing the height of the dam so that the water surface could be raised to elevation 6,769. This work was completed in December, 1916. In the winter of 1918-19 dredging of the river channel below the outlet of Jackson Lake Dam was completed to permit the drawing down of the water in the reservoir to elevation 6,730. This makes the full available capacity of the reservoir 847,000 acre-feet. The drainage area supplying it is 820 square miles.

In the season of 1917 and 1918, immediately after the raising of the dam was completed, water was available to fill the reservoir to its full height. However, some seepage developed through the earth dike and it was deemed advisable to give the dike time to settle before raising the water surface above elevation 6767. The season of 1918 was finished with 96,000 acre-feet in the reservoir, but the storable run-off during the very dry season of 1919 amounted to only 475,000 acre-feet, filling the reservoir to elevation 6760.18. The dredging operations during the winter made available 57,700 acre-feet additional. Thus the total storage available in 1919 was 628,700 acre-feet. With the natural water supply short, the

extra crop production due to the use of water from Jackson Lake amounted to over \$23,000,000.

The curves accompanying this article show the fluctuations in the water surface of the Jackson Lake Reservoir during the past five years.

As soon as the demand for water drops sufficiently to permit it the gates of Jackson Lake are closed and the entire run-off during the winter is conserved. The curves show the great uniformity of the winter flow and the regularity with which the flood season begins during the first half of May. The beginning of the draft upon stored water varies widely with the seasons.

Careful records have been kept of the seepage through the earth dike which is 4,500 feet long. Practically the entire seepage is confined to a length of 1,500 feet.

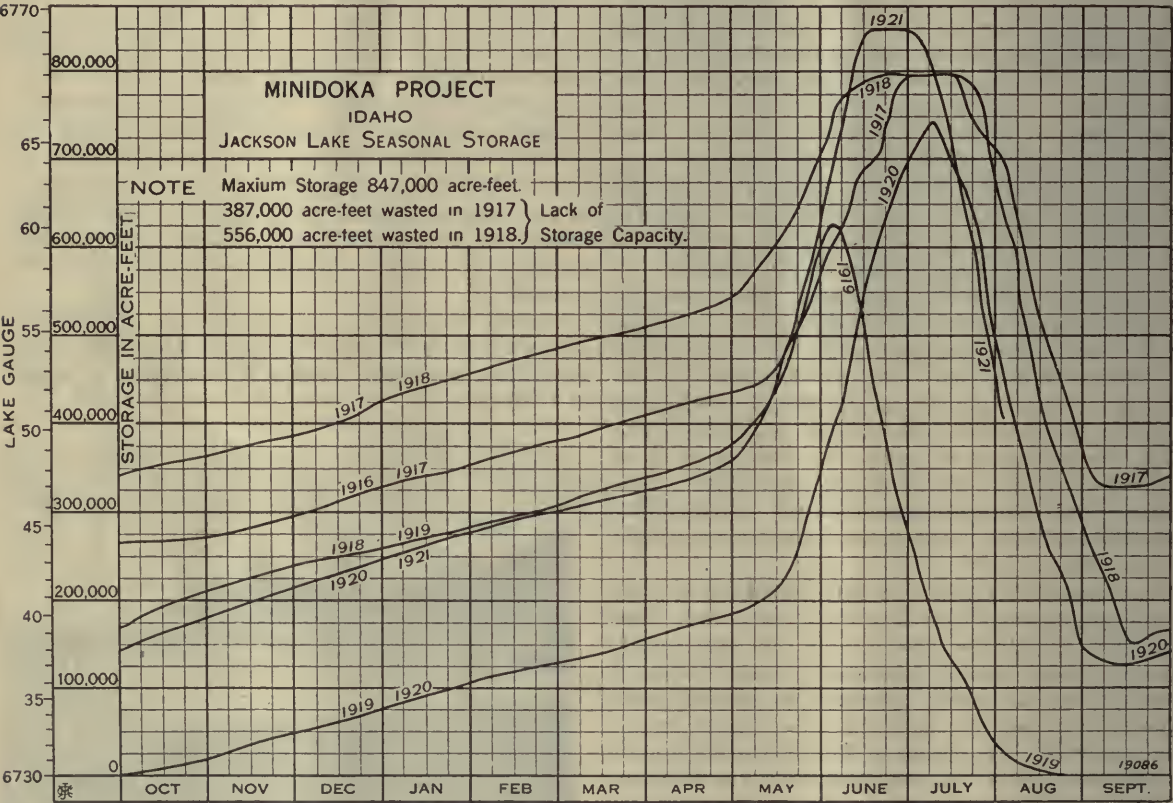


Water flowing over spillway of Jackson Lake Dam, June, 1921.

The Jackson Lake Reservoir supplies water to approximately 750,000 acres of land in the Snake River Valley in Idaho. This is among the largest areas irrigated from any single reservoir in the world. Although primarily initiated to supply water to the Minidoka project, a large number of companies hold Warren Act contracts under which water is furnished to them to supplement a partial supply, giving them rights in the reservoir as listed in the accompanying table.

The construction of Jackson Lake Reservoir seems to have given an impetus to travel through Jackson Hole. The tourist camp at Moran (the outlet of Jackson Lake Reservoir) is a popular resort with farmers from the Snake River Valley in Idaho. Every summer scores of automobiles from Snake River Valley visit the dam. The farmers feel a pride of ownership in the reservoir and the beautiful country surrounding it and they take full advantage of the recreation afforded by the natural features in this vicinity.

Warren Act contracts, Jackson Lake Reservoir.			
Contractor.	Acre-feet contracted.	Area irrigated.	Date of contract.
Aberdeen-Springfield Canal Co.....	40,000	65,000	Dec. 23, 1917
Do.....	2,685	7,000	Do.
Burgess Canal & Irrigation Co.....	5,120	23,000	Mar. 28, 1917
Bradbury & McMullen.....	200	280	Apr. 15, 1917
Enterprise Canal Co.....	6,100	7,000	Do.
Farmers Friend Irrigation District..	2,000	10,000	June 18, 1917
Harrison Canal & Irrigation Co.....	5,000	13,000	Apr. 5, 1917
Lenroot Canal Co.....	3,000	4,000	July 27, 1917
Lowder Slough Canal Co.....	1,040	1,300	Apr. 15, 1917
Martin Canal Co.....	1,500	1,500	Do.
New Sweden Irrigation District....	5,000	27,000	June 29, 1917
Peoples Canal & Irrigation Co.....	8,000	20,000	Apr. 15, 1917
Poplar Irrigation District.....	1,200	1,200	May 1, 1917
Rudy Irrigation Canal Co.....	2,000	8,000	Apr. 15, 1917
SNAKE RIVER VALLEY IRRIGATION DISTRICT.....	15,000	24,000	Aug. 11, 1917
Sunnydell Irrigation District.....	4,000	4,400	June 8, 1917
Twin Falls N. S. Land & Water Co.	321,880	170,000	June 1, 1914
Twin Falls Canal Co.....	97,140	240,000	Feb. 25, 1913
W. S. Lyle.....	155	160	Apr. 15, 1917
Total.....	521,000	626,840	.....
Minidoka Project.....	326,000	121,392	.....
Total supplied by Jackson Lake Reservoir.....	847,000	748,232	.....





Suit Brought by Water Users on Boise Project Settled.

JULY 2, 1917, public notice announcing construction charges on the Boise Federal irrigation project in Idaho and Oregon was issued by the Secretary of the Interior. This notice provided a general construction charge of \$80 per irrigable acre for the lands of the project; but contained a provision to the effect that if all of the lands in question were pledged to return payment of all water charges either through individual contracts, water-users' association contracts, or through irrigation districts duly authorized and confirmed by judicial decree, then the charge of \$80 per irrigable acre would be reduced to \$70 per irrigable acre.

April 1, 1918, the Payette-Boise Water Users' Association brought suit against D. W. Cole, project manager, and others, praying for an order enjoining collection of the charges announced in the public notice. The claim was made by the plaintiff that the water users should not be required to pay the charge announced; that the estimate of cost provided by section 4 of the act of June 17, 1902 (32 Stat., 388), was required to be made before construction and settlement; that a preliminary estimated cost of not exceeding \$30 per irrigable acre, said to have been given by Government engineers prior to the beginning of the project, was a public notice under section 4 of that act and limited the obligation of the water users to that amount; that about \$6,000,000 of the cost of the project which was spent in the construction of Arrowrock and Deer Flat Reservoirs should not be paid by the water users because the act of June 17, 1902, provides that the legal title to the reservoirs shall remain in the United States until further act of Congress; and that certain water contracts between the United States and certain defendant irrigation districts were *ultra vires* and void.

Issue was joined and the case was tried in the District Court of the United States for the District of Idaho, Southern Division, at Boise, Idaho, commencing January 29, 1919. July 21, 1919, an interlocutory opinion was rendered by the trial judge. (Payette-Boise Water Users' Association; Ltd., *v.* Cole et al., 263 Fed., 734.)

In this opinion it was held that the estimate of cost provided by section 4 of the act of June 17, 1902, must be estimated and apportioned before construction of a project, and in case of settlement under such conditions the price could not be later increased, though the published estimate were insufficient to cover the actual cost. The opinion further held, however, that under contract of February 13, 1906, by which the plaintiff association guaranteed repayment to the United States of the cost of the project, the provisions of section 4 had been waived and under the terms of that contract the water users were obligated to reimburse the Government for its actual outlay rather than an estimated outlay, and that in determining this actual outlay there was no room for the exercise of departmental discretion, it being a question purely of existing fact. The opinion further held that in order that the water user may know for what he is paying he must have reasonable muniments of his right and title; that there must be some authoritative description of the property to which his right relates and a definition of the extent of the interest in the project works of which he and all others of his class will be the beneficial joint owners when they have fully paid their obligations; that the owners of the area for which the construction charge has been fixed can be required to pay the cost only of such portion of the works or of such interest therein as is set apart and held for the use of such lands, and until such proportion or interest was decided upon and declared it was impossible to determine the actual cost of the works for which the water user should pay, and hence impossible, intelligently or justly, to fix the construction charge per acre; that the water users were entitled to have from an authoritative source, and of record, a declaration of the cost of the project as a whole, and of the portion of which it was intended they should ultimately become the beneficial owners.

In compliance with this opinion the Secretary of the Interior on October 24, 1919, signed a "Statement of cost and dedication of irrigation works of the Boise project," which was thereafter filed with the court in the case. Under this dedication, one-half of the

capacity of Arrowrock Reservoir was allotted to the lands represented by the plaintiff, leaving an unsold capacity in the reservoir of 76,000 acre-feet.

After the filing of the statement and dedication, further testimony was taken by the court, and on September 18, 1920, a second opinion was filed by the trial judge. (*Payette-Boise Water Users' Association, Ltd., v. Bond et al.*, 269 Fed., 159.)

This opinion was largely a reaffirmance of the former opinion. No final conclusion was reached by the court as to the proper construction charge per irrigable acre or as to the amount of stored water to which the water users were entitled. The court held that the defendant irrigation districts have a right of equal dignity with the association and not a right merely to surplus water; that the Government was entitled to some protection for possible loss of acreage from seepage and land not pledged to make water-right application, but that 10,000 acres was excessive for such allowance, though no definite allowance was suggested; that the subsequent cost of drainage should not be included in a construction charge, but should be charged annually as operation and maintenance. The court suggested that the parties should get together and come to a settlement of their dispute.

Negotiations were thereafter initiated which finally resulted in a contract between the United States and the plaintiff association, which was executed under date of July 12, 1921. Briefly, this contract provides for the sale to project lands of 50,000 additional acre-feet of water from Arrowrock Reservoir and for the expenditure by the United States of from \$200,000 to \$225,000 for supplemental construction work upon approval thereof by a majority of water-right applicants and entrymen, gives to project lands temporary use of 26,000 acre-feet of water from Arrowrock Reservoir until completion of the supplemental construction work, provides that the cost of future drainage work shall be assessed as an operation and maintenance cost payable in advance, and adopts a tentative construction charge of \$77.44, such charge to be readjusted every 5 years for 20 years. The contract sustains the right of the Government to collect the actual cost of construction and amounts to an approval of the validity of contracts between the Government and the Nampa and Meridian, Pioneer, and Riverside Irrigation Districts.

On July 28, 1921, the parties to the suit waived findings of fact and conclusions of law in the case and agreed to the form of a decree approving the contract without costs to either party, which decree was entered on that date. This decree in addition to approving the contract, provides that all members of the plaintiff association must make water-right application upon a special form within 60 days.

Edwin S. Booth.



EDWIN S. Booth, the newly appointed Solicitor for the Department of the Interior, is accredited to Baker, Mont. He is not a native of that State, but was born in 1865 at Keokuk, Iowa, in which State he was educated and admitted to practice as a lawyer. His life, however, has largely been identified with the younger and more massive Commonwealth, where he went upon attaining his majority, and he is known from one end of Montana to the other as an attorney, legislator, and progressive citizen. He has been an active practitioner in all its courts and in the Federal courts, a member of its legislature, and is a genial man-loving and lovable man. When his appointment was announced by President Harding it received commendation from the Democratic as well as the Republican press of the State, as a just recognition of personal worth and ability.

From his advent into Montana he has been in the midst of public affairs, holding positions of honor and public trust. His last service to his State, now terminated by the transfer of his activities to the

Federal field, was in the State senate. He is considered an authority on legislative procedure, and it is said of him that he has drafted more of the laws of Montana than any other individual in the State.

His law practice has had a wide range, embracing the entire legal field, from the prosecution and defense of those charged with capital offenses to the solution of intricate problems in the civil branches of the courts. Once he prosecuted a murderer and obtained a conviction on one day, and, at the request of the convict's relatives, preached his funeral sermon the next day, the convict having taken his own life during the night. This is not to be read as a spectacular incident, but is to be taken as an index of the character of the man, who can perform an official duty without personal offense.

The new solicitor is a thorough westerner and brings with him to Washington a fund of information concerning the problems in which the great West is intimately interested, especially irrigation.

Damages on Account of Seepage from Canal.

Thomas Hooker, the owner of 120 acres of land in Nine-Mile draw in the Farmers' Irrigation District, in Scottsbluff County, Nebr., brought suit against the Farmers' Irrigation District, a corporation of the State of Nebraska, to recover damages to his land which he alleged the corporation had inflicted upon him by permitting and causing water it was taking through its canal to seep therefrom and render 70 acres of his land so wet as to be unfit for cultivation. The trial court dismissed the complaint, but upon appeal to the Circuit Court of Appeals the judgment was reversed and the case remanded with directions to grant a new trial. (*Hooker v. Farmers' Irr. Dist.*, 272 Fed., 600.) The following is taken from the opinion in the appellate court, written by Justice Sanborn:

If the plaintiff sustained damage, as in our opinion there is substantial evidence here tending to prove, by the temporary negligence of the defendant to so maintain, operate, and use its canal as not to injure plaintiff's property, it is liable on account of its negligence to pay that damage. (*Hopkins v. Clemson Agricultural College*, 221 U. S., 636, 646, 647, 31 Sup. Ct., 654, 55 L. Ed., 890, 35 L. R. A. (N. S.), 243; *Dryden v. Peru Bottom Drainage District*, 99 Nebr., 837, 158 N. W., 54.) If, on the other hand, the defendant has inflicted damage upon the property of the plaintiff that is the necessary effect of its permanent maintenance and operation of this canal in a lawful and careful manner, which the State has authorized it to do for the public use, it is liable to pay this damage to the plaintiff because the infliction of such damage without compensation is a violation of the constitutional prohibition against the taking or damaging of private property for public use without just compensation therefor. (*Constitution of Nebraska*, sec. 21, art. 1; *Omaha & N. P. Ry. Co. v. John Janeczek*, 30 Nebr., 276, 278, 46 N. W., 478, 27 Am. St. Rep., 399;

Pumpelly v. Green Bay Co., 80 U. S., 166, 167, 177, 179, 181, 20 L. Ed., 557; *United States v. Lynah*, 188 U. S., 445, 469, 471, 23 Sup. Ct., 349, 47 L. Ed., 539; *Bramlette v. Louisville & N. R. R. Co.*, 113 Ky., 300, 68 S. W. 145, 146; *Jaynes v. Omaha Street Railway Co.*, 53 Nebr., 631, 641, 649, 650, 74 N. W., 67, 39 L. R. A., 751; *Middlekamp v. Bessemer Irrigating Ditch Co.*, 46 Colo., 102, 103 Pac., 280, 23 L. R. A. (N. S.), 795.)

Yuma Mesa Auxiliary Reclamation Fund.

Under the act of January 25, 1917 (39 Stat., 868), as amended by the act of February 11, 1918 (40 Stat., 437), moneys received from the sale of public lands under the Yuma Mesa auxiliary project, in Arizona, may be utilized for the construction of the irrigation works of said project, but reimbursement therefor must be made by the landowners to the auxiliary reclamation fund. Congress failed to make provision for the final disposition of these moneys and they must remain in said auxiliary reclamation fund after repayment, subject to such disposition as Congress may in the future make. (Comp. Dec., May 10, 1921, and July 6, 1921.)

Payment of Cost of Measuring and Apportioning Waters of St. Mary and Milk Rivers.

Officers and employees of the Reclamation Service detailed to act temporarily under the supervision of the International Joint Commission, to measure and apportion the waters of St. Mary River and Milk River in accordance with the treaty of May 13, 1910 (36 Stat., 451), with Great Britain, should be paid their compensation or salaries from the reclamation fund. If, however, there are expenses incurred by such officers and employees solely because of their work with the commission, such expenses may properly be paid from the appropriation for the support of the commission. (Comp. Dec., Apr. 15, 1921.)

Exchange of Lands on North Platte Project.

"An Act Providing for an exchange of lands between the Swan Land and Cattle Company and the United States. [Act Aug. 9, 1921, Public No. 44, 42 Stat., _____.]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That upon proper execution and delivery by the Swan Land and Cattle Company, Limited, a corporation, of a deed conveying to the United States, its successors and assigns, a good merchantable title in fee, free of incumbrance, to certain lands needed by the United States for construction, operation, and maintenance purposes, in connection with the North Platte irrigation project, Nebraska-Wyoming, to wit: The southwest quarter of the northeast quarter and the southeast quarter of the northwest quarter of section twenty-five, township twenty-five north, range sixty-three west, sixth principal meridian, Wyoming; then in exchange for such lands so conveyed a patent shall be issued by the United States to said Swan Land and Cattle Company, its successors and assigns, conveying to said company the northeast quarter of the northeast quarter of section twenty-six and the

northeast quarter of the southwest quarter of section twenty-three, township twenty-five north, range sixty-three west, sixth principal meridian.

Change in Name of Grand River.

Joint resolution to change the name of the Grand River in Colorado and Utah to the Colorado River. [Pub. Res. No. 10, approved July 25, 1921, 42 Stat., _____.]

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That from and after the passage of this act the river heretofore known as the Grand River, from its source in the Rocky Mountain National Park in Colorado to the point where it joins the Green River in the State of Utah and forms the Colorado River, shall be known and designated on the public records as the Colorado River.

SEC. 2. That the change in the name of said river shall in nowise affect the rights of the State of Colorado, the State of Utah, or of any county, municipality, corporation, association, or person; and all records, surveys, maps, and public documents of the United States in which said river is mentioned or referred to under the name of the Grand River shall be held to refer to the said river under and by the name of the Colorado River.

—Ottamar Hamble.

ECONOMY.

In line with letters received from other projects published in the August issue of the RECLAMATION RECORD, the following letter has been received from A. R. McGinness, project manager of the Huntley project:

"It is a difficult matter to estimate the saving in money value, particularly in office supplies for a small office. The following instance is cited: On June 1 I directed that the two canal riders on the upper end of the project report each morning by telephone to the foreman at Osborn, who since then has reported their time each day together with his gang of men. Instead of having a separate time report from each canal rider, one daily report now takes the place of three. While there is a small saving in foreman's daily labor report forms and in the shorter time it takes to handle one report instead of three, you will readily appreciate how difficult it is to estimate the money value of such an economy. I have been in the past and I am now continually on the watch for the opportunity to effect these small savings in the interest of business efficiency."

J. B. Bond, project manager of the Brice project, writes as follows:

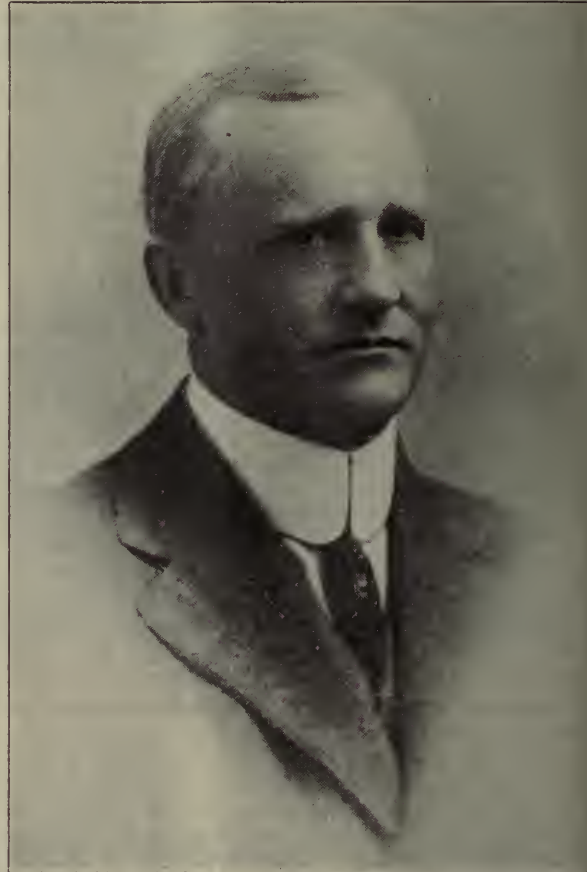
"Among the smaller, but nevertheless practical, economies practiced may be mentioned the following:

"The practice of having typists and stenographers utilize the reverse of the more unimportant incoming letters for replies is encouraged. In such instances the following typewritten note—'See reverse for reply'—is inserted on face of original letter and the carbon reply is written on the reverse."

"GET ACQUAINTED" WRITE-UPS.

A. H. Gullickson, Chief Accountant, U. S. R. S.

A. H. GULLICKSON was born in Preston, Minn. After leaving school he was engaged in the lumber business as bookkeeper, salesman, and manager for his father, and subsequently traveling lumber salesman in Minnesota and Iowa out of La Crosse, Wis., and Minneapolis, Minn.



A. H. Gullickson.

He was employed by the State of Minnesota in the office of the secretary of state and in the grain inspection service, being located at Superior, Wis., for about two years. For about one year he was employed as bookkeeper by the St. Paul Book & Stationery Co.

In 1900 Mr. Gullickson was appointed to a position in the Census Office, with headquarters at Washington, and traveled in Colorado, Kansas, Nebraska, Iowa, Michigan, and Pennsylvania as special agent on mines and mining, wealth, debt and taxation, and manufactures. He was in charge at Pittsburgh of the field work in the manufacturers' census of Allegheny

County, Pa., when transferred to the Reclamation Service in 1905.

Mr. Gullickson was special fiscal agent on the Newlands project, Nevada, from 1905 to 1908, chief clerk, first, of the Sunnyside division, then of the entire Yakima project from 1908 to 1912, and assistant irrigation manager of the Sunnyside division from 1912 to 1913. He resigned to accept the position as business manager of the Southern Alberta Land Co., a large irrigation project in Canada, with headquarters at Medicine Hat, Alberta. On the suspension of active work in 1914, at the outbreak of the war, he returned to Seattle and became manager of the Kitsap County Transportation Co., operating boats in Puget Sound.

In the fall of 1916 Mr. Gullickson was offered and accepted reinstatement in the Reclamation Service as examiner of accounts and was later assigned to the western district, with headquarters at Yakima, Wash. He was appointed chief accountant of the Reclamation Service on March 16, 1920.

Mr. Gullickson is quiet and unassuming in manner, a tireless worker, tactful in handling the many problems which come before him, and fully deserves the high degree of popularity which he enjoys both in the Washington office and the field. He is a veteran of the Spanish-American War, having spent part of his term of enlistment in Porto Rico.

RECLAMATION ABROAD.

Peru.

In connection with the administration of irrigation waters in Peru an executive decree dated June 3, 1921, provides, among other things, that "the judges of first instance in the districts where associations of irrigators have not been formed shall proceed to organize them, levying fines upon those who are slack in joining the associations."

Sukkur Barrage Project on Indus River.

The Government of India announced recently that, if present plans are carried out, 720,000,000 rupees will be expended in the next 15 years upon the Sukkur barrage project on the Indus. It is expected that, when the irrigation projects are completed, the yield of wheat and cotton will be materially increased, as much unoccupied land will be placed under cultivation. This project has long been talked about, and is being backed by the irrigation department of the Bombay Presidency. The plan is to construct a dam at the Sukkur Gorge, some 300 miles above the mouth of the Indus River. When in complete operation it is designed to irrigate and bring under cultivation not less than 5,000,000 acres of land now practically barren.—*Commerce Reports.*

The Reclamation Record.

Issued monthly by the Reclamation Service, Department of the Interior, under the authority of the Secretary of the Interior.

Copies of the RECLAMATION RECORD will be sent free of charge to any water user on our reclamation projects. The subscription price to others is 75 cents a year, payable in advance. Subscriptions may be forwarded to the chief clerk, United States Reclamation Service, Washington, D. C., and remittances (postal money order or New York draft) should be made payable to the special fiscal agent, United States Reclamation Service. Postage stamps will not be accepted.

Material for publication in the RECLAMATION RECORD should be addressed to *Editor*, United States Reclamation Service, Washington, D. C., and should be mailed in time to reach the editor not later than the 14th of the month in order to insure publication in the succeeding month's issue of the RECORD.

HUGH A. BROWN, EDITOR.

SUBSCRIPTION BLANK.

Reclamation Record.

[To be used only by persons who are NOT water users on the projects of the U. S. Reclamation Service.]

_____, 1921.

CHIEF CLERK,

U. S. Reclamation Service,

Washington, D. C.

DEAR SIR: I am NOT a water user on one of the projects of the U. S. Reclamation Service, but wish to receive the RECLAMATION RECORD each month.

I inclose herewith 75 cents for a year's subscription beginning with the current issue.

(Name.)

(Street and number.)

(City and State.)

(Write plainly).

NOTE.—Send money order or New York draft, made payable to Special Fiscal Agent, United States Reclamation Service. Do NOT send stamps.

BUREAU OF THE BUDGET.

Digest of Orders and Circulars.

Circular No. 1, June 27, 1921.—Requests heads and assistant heads of executive departments and independent establishments, chief clerks, chiefs and assistant chiefs of bureaus, etc., to be present at a meeting of the administrative organization of the Government held June 29, 1921.

Circular No. 1, June 29, 1921.—Announces the four basic principles of budget operations in the United States.

No. 1. The Budget Bureau must be impartial, impersonal, and nonpolitical.

No. 2. The Director of the Budget has no responsibility in the matter of Government business administration under the law save for the administration of his own bureau; is simply an adviser of the President and Congress in the matter of correcting business administration.

No. 3. The Director of the Budget in gathering information acts for the President and his calls upon the chiefs of bureaus, etc., for purposes of consultation or information take precedence over the Cabinet head of a department or any head of an independent organization.

No. 4. The budget representative in each department appointed by the Cabinet head will present to the Director of the Budget the views of the Cabinet head upon the wisdom of conclusions drawn by the Director of the Budget, and the call of the Director of the Budget for their presence and advice takes precedence over the Cabinet head.

Circular No. 11, June 30, 1921.—Invites attention to budget and accounting act, section 214, paragraphs a and b, requesting advice as to name, position, location, and telephone number of official in each department and establishment designated as budget officer to prepare departmental estimates and supplemental and deficiency estimates. Directs that replies be addressed to Director of the Bureau of the Budget, Treasury Department, and marked "Budget Officer."

Circular No. 2, no date.—Directs that bureau chiefs submit estimates to budget representatives at earliest possible moment so that budget representatives and the Director of the Budget in consultation may prepare tentative new budget for the fiscal year ending June 30, 1922 by July 31, 1921. "While the first draft of the tentative budget as a whole should be completed by July 31, it will be continually revised during the year in the interest of economy and efficiency and must always be considered as fixing the maximum of expenditure."

Circular No. 3, June 30, 1921.—Directs budget officer of each department, etc., to attend meeting to be held in office of the Director of the Budget, room 374 Treasury Building on Friday, July 1, at 10.30 a. m., the meeting to be called to order by the President of the United States.

July 1, 1921.—Copy of the President's brief address to the budget representatives at the meeting called in Circular No. 3.

July 1, 1921.—First budget regulations: (1) The budget officer for each department, etc., will secure from the head of each bureau or branch an estimate of the portion of the funds available for the fiscal year 1922 the expenditure of which is indispensable in carrying on the activities of such bureau or branch, and the resulting balance which may be saved under each appropriation and will submit such estimates to the head of his department for approval or modifica-

tion, thereafter communicating them to the Director of the Budget, who will in his discretion confer directly with the head of the department with a view to a modification of the estimates, or will make recommendations in regard thereto to the President.

(2) The estimated savings under the several appropriations will be submitted by the Director of the Budget to the President for his approval, and upon such approval the balances thus saved will be designated as a "General Reserve" and so carried under their respective appropriation titles on the records of the Director of the Budget and of the department.

(3) The amount approved by the President for expenditure under an appropriation title shall be considered as the maximum available for obligation during the fiscal year. Estimates of expenditures once approved, will be subject to further study and revision during the fiscal year and all possible additional savings will be effected. To this end the heads of bureaus will maintain upon their financial records additional sums reserved from obligation so that if the developments of the fiscal year permit, these amounts may be added to the general reserve.

Circular 5, July 6, 1921.—1. Heads of executive departments, etc., ordered to cause an immediate survey to be made of amount of material, supplies, and equipment not now being efficiently used. Departmental surplus for which a specific use within the current fiscal year is not foreseen must be turned over to the General Supply Committee of the Treasury Department for reissue to other branches of the Government service.

2. A thorough investigation of all files must be made with a view to releasing any filing equipment not absolutely essential; active records to be consolidated and inactive records removed to less expensive transfer or storage cases.

3. Only standard contract articles may be purchased in providing furniture and equipment for offices in such cases as Government property is not obtainable by transfer.

4. Effort must be made to utilize such types and styles of equipment as are available from the surplus stock, and where no typewriters are available for reissue or transfer within the department, used typewriters in possession of the General Supply Committee of the Treasury Department must be utilized irrespective of make.

July 5, 1921.—Transmitting Form No. 1 to be used in preparation of revised budget for the fiscal year 1922, to be submitted to Director of Budget by July 15, 1921, and instructions for preparation of revised budget on this form.

Circular No. 7, July 8, 1921.—Directing that whenever advertisements for bids are contemplated in connection with surplus property available for disposal, before such advertisements are made public copies of the same in the exact form in which intended to be published shall be sent to Surplus Property Division or corresponding agency of each executive department.

Circular No. 8, July 7, 1921.—Calling for certain specified information as to indefinite appropriations and authorizations available for expenditures for fiscal year 1922 under existing law to be transmitted to the Director of the Budget by July 15, if possible.

Circular No. 9, July 11, 1921.—Additional information in connection with statement required on Form 1—i. e., omit increase in compensation and printing

and binding paid from departmental and bureau allotments. Include permanent and indefinite appropriations for 1922; make no deductions in columns 3 and 5 on account of transfers to civil-service retirement and disability fund. Take care in the case of special and trust funds not to include credits in column 2 which may also appear as estimated appropriations and expenditures in column 3. Total appropriations for 1922 (listed) will be basis of column 3 and should be checked with totals made up by Bureau of the Budget before final completion of statement.

Circular No. 10, July 12, 1921.—Calls for report as to what reports are to be discontinued under authority of second deficiency appropriation act for the year 1921, approved June 16, 1921 (quoted), and estimated savings to be effected thereby.

Circular No. 11, July 15, 1921.—Instructions and sample form for submission of estimates of appropriations for annual budget and the schedules of expenditures to accompany the same.

July 15, 1921, no number.—Directing purchasing agents to get in immediate touch with Shipping Board with an idea to seeing if any of their surplus material at Hog Island can be profitably used by another bureau.

Circular No. 12, July 21, 1921.—Directing that sales of Government surplus property cease and all selling agencies dealing with the sale of Government surplus property be so notified until Executive order announcing institution of coordinating machinery shall be issued shortly.

This order does not apply to transfers of surplus property from one department of the Government to another and is not intended to prevent the departments from taking advantage of any exceptional or seasonal opportunities for the sale of property, especially perishable property.

Circular No. 13, July 21, 1921.—Copies of proposed advertisements for bids before publication should be sent to the following four departments, addressed as indicated, to comply with circular of July 18. When total value of supplies required at any one time aggregates less than \$100, informal inquiry will suffice.

United States Shipping Board, Director of Supply and Sales.

War Department, Director of Sales.

Navy Department, Bureau of Supply and Sales.

General Supply Committee, the chairman.

Circular No. 14, July 22, 1921.—Relative to organization of permanent conference on printing, purpose, representation, authority, and time of meeting.

Letter of July 23, 1921, in answer to one from Interior Department.—Field-service requirements should be filled from General Supply Committee surplus only when required for use within economical shipping distance of Washington, D. C.

Committee does not crate furniture for shipment but delivers to ordering office.

When field offices are discontinued all surplus furniture and supplies should be promptly reported to General Supply Committee, but should not be forwarded to General Supply Committee unless specific request is made for such shipment, as cost of packing and transportation might exceed value of articles in many cases.

Circular No. 15, July 27, 1921.—United States divided into nine areas corresponding to nine Army corps areas and coordinator for general supplies selected for each area. Duties of such coordinator outlined. Office of chief coordinator, general supply, created in the office of the General Supply Committee and his duties outlined. Director of purchases and a

JULY WEATHER IN THE WESTERN STATES.

By P. C. Day, United States Weather Bureau.

JULY in the Western States was mainly a little hotter and drier than the average. When the month opened, unseasonably cool weather dominated the northern districts west of the Rocky Mountains and the coolness soon extended southward and southeastward; it was not felt to any considerable extent in California or the Dakotas, and in most other States it did not last long, save in New Mexico and some adjacent districts. The latter half of the month was mainly a little cooler than normal in New Mexico and western Texas, also in western Washington; but elsewhere mainly hotter than normal, particularly in Montana, Wyoming, and Idaho. The last few days, however, were rather cool nearly everywhere in the vicinity of the Mexican border and throughout California, and likewise it was cool at this time on the east slope of the northern Rocky Mountains.

Early in the month there was important rainfall in most parts of Colorado, Montana, and the Dakotas. In the latter part of the first decade irregular rains reached large parts of southern New Mexico and western Texas. About the 14th notable rains occurred in many southern portions of Utah and Colorado, and during the latter half of the month those States, especially the southern portions, and Arizona, New Mexico, and the Texas Panhandle were visited by frequent showers, of rather irregular distribution, but usually of beneficial amount. The last week brought light to moderate rains to many parts of Montana and the Dakotas. The month's precipitation was irregularly distributed in the central and southern Plateau States, and was mainly less than normal there; in California it was practically nothing, as was to be expected; while in the North Pacific States it was nearly everywhere much less than normal, and likewise in Idaho and Wyoming.

director of sales to be appointed in each executive department, duties, etc.

Circular No. 16, July 29, 1921.—Designations of chief coordinator, Col. H. C. Smither, three assistants in his office; four officers for duty with corps areas; officers of Navy Department to be announced later.

Circular No. 17, August 2, 1921.—Advance report of estimates of appropriations for fiscal year 1923, stated by appropriation titles and amounts only in order in which they will appear in regular estimates, to be furnished Director of Budget on or before September 1, 1921. New proposals to be briefly explained in accompanying note. Corresponding appropriations for fiscal year 1922 to be set opposite the amount of the estimates. Report to be made on estimate blank No. 1 and delivered to Division of Estimates, Bureau of the Budget. Is preliminary and does not take the place of the regular submission of estimates on or before September 15.

MONTHLY PROGRESS REPORTS FOR JULY, 1921.

Monthly conditions of principal Reclamation Service reservoirs for July, 1921.

[Elevation above sea level.]

State and project.	Reservoir.	Available capacity in acre-feet.	Elevation.		Storage in acre-feet.			Out-flow in acre-feet.	Elevation of water surface.		
			Spill-way crest. ¹	Lowest gate sill. ²	Beginning of month.	End of month.	Maximum.		Beginning of month.	End of month.	Maximum.
Arizona, Salt River.....	Roosevelt ³	1,305,000	2128	1903	576,391	523,155	576,391	.....	2010.97	2065.78	2010.97
California, Orland.....	East Park.....	51,000	1199.68	1111.68	46,650	32,850	46,650	12,746	1197.28	1188.42	1197.28
Idaho:											
Boise.....	Arrowrock.....	280,000	3211	2956	279,000	208,250	279,000	239,906	3211.8	3185.7	3211.8
	Deer Flat.....	177,000	2518	2488	144,471	85,329	144,471	65,084	2514.5	2506.9	2514.5
	Lake Wolcott.....	95,180	4245	4236	106,030	100,970	106,630	372,939	4245.9	4245.48	4245.95
	Jackson Lake.....	847,000	6769	6730	847,000	472,700	847,000	499,940	6769	6753.53	6769
Montana:											
Milk River.....	Nelson.....	27,000	2214	2200	25,240	22,700	25,240	2,520	2211.87	2210.96	2211.87
St. Mary Storage.....	Sherburne.....	66,000	4788	4720	18,000	32,000	32,000	.....	4834	4863	4863
Sun River.....	Willow Creek.....	16,700	4130	4085	17,290	10,339	17,290	9,390	4130.5	4122.9	4130.5
Nebraska-Wyoming, North Platte.	Pathfinder.....	1,070,000	5852	5670	1,123,870	929,192	1,123,870	341,768	5854.33	5845.42	5854.33
	Lake Alice.....	11,400	4182	4159	7,124	5,230	7,124	.....	4175.9	4172.7	4175.9
	Lake Minatare.....	60,700	4125	4074	58,625	38,486	58,625	.....	4124	4113.7	4124
Nevada, Newlands.....	Lake Tahoe.....	120,000	6230	6224	.....	.....	.....	13,474	6226.68	6226.52	6226.69
	Lahontan.....	290,000	4162	4060	265,700	220,100	265,700	37,370	4161.2	4156.1	4161.2
New Mexico:											
Carlsbad.....	McMillan.....	45,000	3267.7	3241.6	45,000	42,500	45,000	114,000	3267.7	3267.4	3267.7
Rio Grande.....	Elephant Butte.....	2,638,800	4407	4231.5	2,073,405	2,052,064	2,080,518	120,390	4391.8	4391.2	4392
Oregon, Umatilla.....	Cold Spring.....	50,000	621.5	560	36,800	21,750	36,800	13,912	612.13	598.87	612.13
Oregon-California, Klamath.	Clear Lake.....	462,000	4540	4514	394,000	372,000	394,000	372	4537.44	4536.54	4537.44
South Dakota, Belle Fourche	Belle Fourche.....	203,000	2975	2920	158,380	118,040	158,380	40,033	2968.9	2962.7	2968.9
Utah, Strawberry Valley....	Strawberry.....	250,000	7558	7514	257,200	240,600	261,520	16,600	7559	7556.7	7559.6
Washington:											
Okanogan.....	Coneonully.....	14,400	2290	2232	10,964	6,475	10,964	5,322	2283	2271	2283
Yakima.....	Bumping Lake.....	34,000	3426	3389	38,190	38,875	39,495	620	3429.35	3429.85	3430.3
	Lake Cle Elum.....	22,800	2134	2122	28,640	26,175	28,640	2,465	2136.01	2134.95	2136.01
	Lake Kachess.....	210,000	2258	2192	219,885	235,135	235,135	.....	2257.74	2261.15	2261.15
	Lake Keechelus.....	152,000	2515	2425	149,545	121,125	153,780	32,655	2513.75	2501.81	2515.43
Wyoming, Shoshone.....	Shoshone.....	456,600	5360	5132.3	474,858	457,937	474,858	128,891	5362.7	5360.2	5362.7

¹ Or maximum storage.² Or zero storage.³ Zero water depth at elevation 1902.2.⁴ Amount of silt shown by silt survey deducted from original capacity.⁵ Proposed regulation.⁶ Estimated low-water limit under proposed plan of regulation.⁷ Elevation of reservoir raised 12 inches by stop logs in spillway.

SALT RIVER PROJECT, ARIZONA.

Operation and maintenance of irrigation system.—Water was run in all of the canals during July. There was considerable rainfall on the watershed during the latter part of the month, causing a slight increase in the contents of the reservoir.

Five regular maintenance crews were in the field during the month and one special crew cleaning moss from the canals. The following statement shows the average number of men and stock and the results accomplished: Average number of men, 146½; average number of stock, 35; miles main canals cleaned, 63½; miles laterals cleaned, 224½; number of old structures repaired, 81; linear feet stake and brush banks, 1,834; cubic yards of dirt fill placed, 1,907; cubic yards of concrete placed, 13½.

In addition to the above crews, one regular construction crew and a part of the regular maintenance crews accomplished the following results: Average number of men, 70; average number of stock, 44; new structures installed, 33; cubic yards of dry masonry replaced, 1; cubic yards of concrete placed, 80; linear feet 24-inch corrugated pipe placed, 721; linear feet 30-inch corrugated pipe placed, 103; linear feet 36-inch corrugated pipe placed, 14; linear feet 48-inch corrugated pipe placed, 151; linear feet 24-inch concrete pipe placed, 12; number miles waste ditches built, 6½.

The Ruth dredger was engaged in berming the Western Canal, with a daily average of 2½ men and 2

head of stock. This machine moved 6,400 yards of dirt during July.

Work on widening the Eastern Canal continued. The Lidgerwood 1½-yard machine moved 10,509 cubic yards and the Monihan 2-yard machine moved 13,810 cubic yards.

Operation of power system.—The total power generated during the month was 7,723,890 kilowatt hours. The Roosevelt plant operated practically continuously and generated 5,024,000 kilowatt hours; the Cross Cut operated 63.2 per cent of the month with an output of 1,576,550 kilowatt hours; the Arizona Falls plant operated 97.3 per cent and generated 332,700 kilowatt hours; the South Consolidated operated 99.2 per cent with an output of 517,200 kilowatt hours; and the Chandler plant operated 98.5 per cent, generating 273,440 kilowatt hours.

The substations all operated during the month without trouble. Lightning arresters were overhauled at the Chandler, Glendale, and Marinette substations.

Maximum use was made of the pumping plants of the project during July up to the time of river floods.—C. C. Cragin.

YUMA PROJECT, ARIZONA-CALIFORNIA.

July weather was favorable for alfalfa seed and thrashing was well under way; the crop is about normal. Prospects were good for the cotton crop.

Construction.—Several small timber structures were built in connection with the South Drain. Excavation

on the South and East Drains was suspended during the month.

Operation and maintenance.—The West Main Canal was reconstructed around the break at the 17-mile post and water was turned through on the 18th; the earthwork on the levee was completed; a total of 24,000 cubic yards of class 1 material was moved. Twenty-one thousand and seven hundred acre-feet of water were delivered to users. On the Reservation Division, Ruth dredger No. 6 cleaned 6 miles of laterals, excavating 9,000 cubic yards of silt; in the Valley Division three Ruth dredges cleaned 16 miles of laterals, excavating 22,000 cubic yards of silt. Thirteen thousand cubic yards of riprap were placed on the levees.

The maximum discharge of the Colorado River was 106,000 second-feet; minimum, 28,000 second-feet. On July 31 the gage height was 20.2 feet, with a discharge of 33,000 second-feet. The total discharge for the month was 2,816,000 acre-feet.—*Porter J. Preston.*

MESA DIVISION.

The hot weather during July made working conditions not so favorable.

The crushing plant at the mesa quarry was operated part of the time. The rock crushed was used in surfacing roads and for concrete at the B Lift pumping plant.

Construction at the B Lift pumping plant was continued, with a force of about 15 men. Work consisted of erecting forms and placing reinforcing steel for the superstructure, force main, and fore bay and the pouring of the fore bay.

The erection of the pipe-manufacturing plant was carried on. The crusher and engine from the old bin were moved to the new plant; screen, elevator, and cranes were put in place in the new plant.

On July 1 the 30-B Bucyrus drag line, operating on the Supply Canal, was transferred to the Yuma Valley for repair work on the West Main Canal and Valley Levee.

The whole force of the Yuma Mesa was transferred from their work on the mesa to river control work from July 1 to 5, inclusive.

Office engineering was confined to routine work now being carried on and detailing future construction.

Efficient labor was scarce.—*Porter J. Preston.*

ORLAND PROJECT, CALIFORNIA.

High temperatures prevailed during July. On 21 days of the month a maximum of 100° or more was recorded. An extremely high north wind occurred on the 2d and 3d which resulted in considerable damage to orchards and growing crops.

The third crop of alfalfa was harvested during the month, and the early planting of milo made a good growth. The first of the season's shipment of watermelons, consisting of one carload destined for Portland markets, left the project on the 30th. The Orland Alfalfa Meal Mill continued operations throughout the month. Twenty-one hundred tons of hay have been ground by the mill during the present season.

The natural flow of both Stony and Grindstone Creeks diminished until there was little water available from these sources for project use at the close of the month. Draft from storage at East Park Reservoir amounted to 12,700 acre-feet and 8,500 acre-feet were delivered to 14,000 acres which were irrigated.

The maintenance force, consisting of three men, was engaged in mowing and burning weeds on canals and laterals and in mixing grasshopper poison, of which 1 ton was prepared and sold to water users. One team was engaged in the delivery of 108 cubic yards of gravel for use in fall work of concrete lining.—*R. C. E. Weber.*

GRAND VALLEY PROJECT, COLORADO.

July weather was slightly cooler than normal, with an excess of precipitation. Conditions were favorable for farming operations as well as for construction work.

The second crop of alfalfa was nearly all cut and shocked. The yield in general was up to normal except where damaged by grasshoppers. Winter wheat was harvested and thrashing was in progress. The yield of this crop is excellent, in some cases exceeding 40 bushels per acre. Sugar beets were in first-class condition and indications were that the yield would be above the average. Grasshoppers caused serious damage to alfalfa seed and other crops in some parts of the project.

The irrigation system was operated continuously during the month, delivering 14,500 acre-feet of water to 20,000 acres of land in the project and the Palisade and Mesa County Irrigation Districts. No maintenance difficulties were experienced, and water deliveries were made to all farms with little interruption. Maintenance work was limited to the repair of minor breaks and cleaning of weeds and moss from laterals.

Drainage construction was prosecuted with one drag-line excavator working in the Grand Valley Drainage District and three excavators on project drains. Two and two-tenths miles of drain were completed, involving 44,000 cubic yards of excavation. The project drains northwest of Mack were completed and the machines stored.—*S. O. Harper.*

UNCOMPAHGRE PROJECT, COLORADO.

Weather conditions during July were about normal during the entire month. Seven heavy rains occurred at the Montrose Station, which brought the total precipitation up to 1.94 inches. This rainfall was the heaviest since July, 1911.

The crop situation at the end of the month was about normal both in stand and growth, and the harvesting of early potatoes was begun during the latter part of the month.

The flow available in the Gunnison and Uncompahgre Rivers was sufficient to furnish a full head in all project canals and laterals and the capacities of the canals were sufficient so that 100 per cent delivery could be made to all project farms during the entire month.

Several small floods occurred in the adobe region on the east side of the project, but little damage was caused to any of the project works. The Loutsenhizer Arroya region was visited by a flood on the last day of the month. This flood was even larger than the one that occurred on June 14. The only damage done was the washing out of the wagon bridge below the Loutsenhizer flume.

No serious shutdowns occurred in the canal system.

The P. & H. dragline completed the repair work on the West Canal on the 13th and then moved to the Montrose & Delta headworks. The Montrose & Delta and Selig Canals were shut down for a period of 40 hours each, in order to permit the removal of gravel

that had washed in during the June floods. This work was accomplished by operating the dragline continuously on a basis of five shifts of eight hours each.—*L. J. Foster.*

BOISE PROJECT, IDAHO.

During July the weather was extremely hot and dry. Under irrigation conditions were favorable for plant growth except for small grains, which were injured to some extent during the stage of filling on account of the extreme hot weather.

Labor conditions.—A number of men obtained employment in the harvest fields, which reduced the number of unemployed. There was no change in the wage scale.

Farming operations.—The greater part of the second cutting of alfalfa was harvested, and the grain harvest was begun. A portion of the early crop of potatoes was shipped, but the market was very unfavorable.

Water supply.—The flow of Boise River decreased from 7,000 second-feet to 1,250 second-feet during the month. The total discharge for July was slightly below normal. The combined storage in Arrowrock and Deer Flat Reservoirs will be ample for the balance of the irrigation season.

Operation and maintenance.—The entire canal system was operated to capacity, with a very heavy demand for water. No serious difficulties were encountered. A few minor breaks occurred. The rapid growth of moss and weeds necessitated constant cleaning of the canals. The Austin dragline excavator continued cleaning the drains in the Fargo Basin until the 16th, when work was discontinued for the balance of the season.

Drainage.—The 1-yard dragline excavator continued work in the Fargo Basin. From the first to the middle of the month it was operated with one shift per day. During the remainder of the month two shifts were employed.

Surveys.—No field work was under way in connection with the Boise project. Two field parties were employed on the Owyhee project investigations which are being conducted in connection with the State of Oregon.

Visitors.—A. P. Davis, director, and F. E. Weymouth, chief engineer, were on the project the last of the month.—*J. B. Bond.*

KING HILL PROJECT, IDAHO.

Weather during July was favorable for construction work.

Operation and maintenance.—Delivery of water by Government forces was uninterrupted throughout the month. Water service was discontinued for about 700 acres of land at the lower end of the project to permit the reconstruction of the Cold Springs flume.

Construction.—Construction of the Cold Springs concrete flume was commenced on July 11 on which date removal of the old wooden structure was begun. Excavation of the flume bench was started with a P. & H. dragline on the 12th, and with men and teams on the 13th. Pouring of concrete was commenced July 25 and at the end of the month 790 linear feet of the new flume were in place.

Field and office engineering.—One field party was engaged throughout the month on line and grades. One man has been engaged 15 days on a field examination of irrigated areas as stipulated in the contract with the King Hill Irrigation District.

Construction of the camp and plant used in connection with the building of the Cold Springs flume was completed during the month.—*Walter Ward.*

MINIDOKA PROJECT, IDAHO.

Unusually warm and dry weather prevailed during almost the entire month of July and as a result the demand for water remained practically at a maximum on both the Pumping and Gravity Divisions. There were no serious interruptions to service from any cause during the month, and in general the supply was ample for all needs. On the Gravity Division, however, it was necessary for a short time to limit the amount of water used on mature alfalfa.

Regular maintenance work was carried on throughout the month. In addition to the delivery of water, three crews were engaged most of the time in the removal of moss, which has been very troublesome. A special kind of disk plow was used very effectively on this work.

Power was obtained during the entire month from the Boise power plant over the lines of the Idaho Power Co. and the Milner transmission line. This additional power was effective in giving greatly improved service at the pumping stations, especially in maintaining a uniform flow.

The power house was operated to capacity practically the entire month. The total power generated was 5,500,840 kilowatt hours, as compared with 5,684,240 kilowatt hours during July, 1920. A speed of 61 cycles, or 1 cycle above normal, has been maintained almost constantly since July 7. On July 6, No. 3 transformer became overheated and it was necessary to remove it for examination and repairs. It was replaced with a spare transformer. At the Boise plant all three units were in operation at the end of the month, No. 1 transformer being put into service on the 18th.

The pumping stations were run to normal capacity during almost the entire month. On the 19th No. 2 unit at the first lift was shut down for eight hours on account of the burning of a motor coil.

Rearrangement and enlargement of the Rupert substation was under way at the close of the month. When completed, the capacity of this station will be increased from 1,500 to 2,100 kilowatts.

Delivery of stored water from Jackson Lake was begun on July 2, when 1,040 second-feet were released. This discharge increased until on the 31st the stored-water discharge was 9,200 second-feet. On that date the water remaining in the reservoir was 472,700 acre-feet out of 847,000 acre-feet at the beginning of the month. Since July 20 the project has been using stored water entirely. The total amount of stored water diverted to the project was 103,400 acre-feet.

At American Falls the principal work was in connection with the new town site. The topographic survey of it was completed, as were also preliminary plans for the town, coordinates were laid out, and ties taken to the railroad and to the old town site.

The work of appraising country property was continued.

Ten contracts for the purchase of right of way were approved at a valuation of \$22,620, and three purchases were completed at a cost of \$7,275. The total expenditures to date for right of way are \$209,996.11, which covers 72 purchases.

Three parties were engaged on topographic surveys of the North Side Pumping Division. They covered 8,520 acres, of which 1,280 acres were in the west end, thus completing this feature of the work, and 7,240

acres were in the Acequia extension. To date 151,290 acres have been surveyed in this division.

A contract was executed between the Reclamation Service and the Boise Chamber of Commerce providing for a survey of the proposed Mountain Home project. One level party worked about half the month in the vicinity of King Hill developing a section of the most difficult portion of the proposed canal location. About 37 miles of levels were run.

Shipments of farm products amounted to 84 cars, including 6 of hay, 28 of flour and wheat, 39 of sugar, 4 of potatoes, 4 of live stock, and 3 miscellaneous. Some potato buyers were contracting for this year's crop at \$1 per hundred pounds, and the farmers were feeling much encouraged over the outlook for fall prices. All crops were in excellent condition. Harvesting of wheat and barley was in progress at the end of the month, and the second cutting of hay was begun. The warm weather was favorable to crop growth.

The flow of Snake River at Howells Ferry was controlled entirely at Minidoka Dam. The total discharge during the month was 372,939 acre-feet. The maximum flow was 7,142 second-feet on the 7th and the minimum 5,631 second-feet on the 17th. The total amount of water pumped at the first lift was 44,765 acre-feet.

Visitors during July were Mr. W. H. Snelson, of the Canadian Reclamation Service, Calgary, Alberta, Canada, on July 12, and E. A. Cleveland, Commissioner of Reclamation of Canada, on the 18th. The director and the chief engineer were at American Falls on the 20th to discuss matters connected with the reservoir and the new town site.—*Barry Dibble.*

HUNTLEY PROJECT, MONTANA.

Dry, hot weather prevailed throughout July, causing material damage to wheat and small grains generally. The peak of the irrigation season was reached in the period from the 11th to the 25th, during which time the auxiliary pumps were in continuous operation and the diversion into the Main Canal was the maximum possible at this time.

On July 18 the district court at Billings, Mont., granted a decree organizing the Huntley Project Irrigation District, with the following water users as commissioners: A. L. Makinson, president; J. H. Hancock, secretary; H. M. Van Saun; A. J. Bowman; O. P. Pesman.

The operation and maintenance work was reduced to a minimum during the month and only a small number of laborers were employed.

No unusual conditions obtained, and only routine work was taken care of. During the night of the 27th fire of unknown origin destroyed the North Midland Lumber Co. yard and hardware store at Worden, Mont. About \$4,000 worth of private machinery had been stored in the sheds for the night and this was a total loss. No wind was blowing or a large part of the town would have been destroyed.

Agricultural.—Harvesting had begun throughout the project and thrashing was well under way. The local elevator reported receipt of 500 bushels of grain per day. The second cutting of alfalfa was going into stacks and was very light; it was estimated that the season's crop will not be more than half the normal yield.—*A. R. McGinness.*

MILK RIVER PROJECT, MONTANA.

July weather was favorable for crop growth, although construction and operation and maintenance

work was slightly interfered with by heavy rains. Some crops were destroyed by hail. The precipitation at Malta was 3.48 inches, which is 1.60 inches more than the normal for July. The temperature was about normal. The water supply in the Milk River was supplemented throughout the month by diversions from the St. Mary River and with this supplemental water was ample to supply all demands. The project crops were in excellent condition and dry-land crops in the vicinity of Glasgow, Malta, and Dodson were looking well, but in the high line country west of Harve drouth conditions prevailed for the fifth consecutive season. The second cutting of alfalfa was well under way. Harvesting had commenced on irrigated crops and was in full swing on dry-land crops. The range and stock were in fine shape. No epidemics were reported. The labor supply was ample in the fore part of the month, but somewhat deficient at the close of the month.

Surveys.—Farm unit and lateral extension surveys were continued in the vicinity of Glasgow and Hinsdale. Two topographic parties were started on detailed topography of Beaver Creek Flats and work of putting in a series of test wells on the Beaver Creek Flats as well as other drainage investigations were continued.

Construction by contract.—The contractor for enlargement of Nelson Reservoir made good progress. Six small earthwork contracts were under way, two of which were completed; on two more the contractors made good progress; and on the remaining two poor progress was made. One contractor on small structures made good progress; and a second contractor on small structures commenced work with a small force.

Construction by Government forces.—The road crew completed work on the Nelson Reservoir Main Canal, building 10 miles of road, and moved to the Vandalia Canal where they completed 2½ miles of road. The concrete siphon, carrying the NS-116-2-10 Lateral across Beaver Creek, about 5 miles west of Hinsdale, was completed. About 45 minor structures, consisting of turnouts, checks, weirs, and other measuring devices were placed at various points on the project. The grounds and roads adjacent to the buildings at Vandalia Diversion Dam were graded. Drainage construction by P. & H. dragline was commenced on the ND-1 located about 3 miles west of Nelson Reservoir.

Operation and maintenance.—All canals on the Malta and Glasgow Divisions were operated intermittently for the delivery of small amounts of water to farmers. The rains were so distributed and of such amount that only a small amount of irrigation water was desired by the irrigators; 120 deliveries, aggregating 900 acre-feet, were made during the month. On the Chinook Division the three principal private canals were operated throughout the month, and during the latter part of the month used some St. Mary water. The principal items of maintenance work included continuing cleaning of the Dodson North Canal by drag line working one shift per day, and completion of cleaning the NW-1-3 by drag line. This latter machine was moved onto drainage work in the latter part of the month. A Ruth ditch cleaner was received during the month, put into commission near Dodson on the 14th, and operated one shift per day the balance of the month, cleaning 3½ miles of lateral during that period. Protection of the river bank by brush revetment at Vandalia Point was continued, and protective work on the river bank, mile 8 of the DS-50 lateral, near Wagner, was commenced. This protection is of a pile and brush wing-dam type.

A small crew continued grubbing willows on the DS-50 lateral. Sluicing operations to remove slides at Vandalia Point were resumed, but interrupted by high water in the river.—*Geo. E. Stratton.*

ST. MARY STORAGE DIVISION.

July weather was unusually warm for this section. The precipitation was due almost entirely to local showers, which did not interfere materially with the work in progress.

St. Mary Canal was operated the entire month. A total of 23,689 acre-feet was diverted from St. Mary River and 19,414 acre-feet were delivered to the North Fork of Milk River. The natural flow of the river during the month was ample to answer the requirements for diversion. The gates at Sherburne Lakes Reservoir were closed until the 10th, when they were opened to allow part of the natural flow to pass. On the 10th the storage amounted to about 18,000 acre-feet and at the end of the month, when all of the natural flow of the river was passing Sherburne Lakes Dam, the storage amounted to approximately 32,000 acre-feet.

A crew, consisting of a foreman, with an average of 9 men and 4 teams, continued rebuilding canal bank to prevent excessive seepage. The Bucyrus dragline continued the removal of slide material from the canal section and moved a total of 7,915 cubic yards. At Sherburne Lakes Dam nearly all of the construction work proposed at this time was completed during June and the work done at this point during July was confined to cleaning up around the dam and storing equipment and materials, etc.—*R. M. Snell.*

SUN RIVER PROJECT, MONTANA.

July weather was very warm. A copious rain on the 2d and 3d enhanced the prospect for fair dry

land crops where they had not already been burned out. Three or four other light showers occurred during the month. A hailstorm on the 14th damaged grain to some extent on the east end of the Greenfields Bench.

Construction work by Government forces consisted of improvement of operation road along Pishkun and Sun River Slope Canals, and of casting headwalls for culverts and turnouts for Lateral D extension, Fort Shaw Division. Contract work on earthwork and structures of Beale Division continued throughout the month.

Operation of the Fort Shaw Division was continuous throughout the month; a maximum of 240 second-feet was diverted into Fort Shaw Canal. Operation of the Greenfields Division was interrupted by two leaks in the concrete lining of Greenfields Canal and by a slide of the lower part of the bank of Pishkun Canal in Arnold's Coulee. Repairs were made within a few days and water service resumed. A maximum of 300 second-feet was delivered at the Fairfield Drop.

Maintenance work consisted chiefly of repairs to the leaks in the Pishkun and Greenfields Canals mentioned above, puddling canals, repairing minor structures, and cutting weeds in laterals.

Harvesting of the first crop of alfalfa was completed and a start made on early grain. Alfalfa and grain crops that were irrigated in season were in excellent condition. The potato crop, which was backward and below average, improved wonderfully during the last two weeks of the month. Five cars of wheat and one of flax were shipped from the project during the month.—*Geo. O. Sanford.*

LOWER YELLOWSTONE, MONTANA-NORTH DAKOTA.

The precipitation for the month of July amounted to 2.15 inches, 1.75 of which fell in the first three days of the month. The average rainfall for July since

Crop report, irrigated farms, Fort Shaw Division, Sun River project, Montana, 1920.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.			
			Total.	Average per acre.	Per unit of yield.	Total	Per acre.	
Alfalfa.....	5,193	Ton.....	10,830.3	2.08	\$10.00	\$108,300	\$20.80	
Alfalfa seed.....	87	Bushel.....	122.2	1.40	12.00	1,468	16.85	
Barley.....	84	do.....	2,080.0	24.7	1.00	2,080	24.75	
Clover hay.....	67	Ton.....	83.0	1.2	10.00	830	12.30	
Clover seed.....	82	Bushel.....	570.3	6.9	4.80	2,737	33.30	
Flax.....	77	do.....	700.0	9.1	1.20	840	10.90	
Garden.....	52				187.88	9,770	187.88	
Hay (except above).....	187	Ton.....	150.1	.8	10.00	1,500	8.05	
Oats.....	501	Bushel.....	10,355.0	20.7	.70	7,250	14.45	
Pasture.....	718	Acre.....			7.50	5,385	7.50	
Potatoes.....	164	Bushel.....	27,624.0	168	.70	19,300	117.70	
Wheat.....	1,170	do.....	16,448.4	14	1.25	20,560	17.55	
Miscellaneous.....	18					1,580		
Total cropped.....	8,400	Total and average.....					181,600	21.62

	Areas.	Acres.	Farms.	Per cent of division.	
Acres irrigated on 203 farms.....	8,010	Total irrigable area farms reported.....	11,682	283	84.9
Town sites, etc.....	37	Total irrigated area farms reported:			
Miscellaneous.....	3	Under water-right applications.....	7,863	198	57.2
Total irrigated.....	8,050	Under rental contracts (town sites, etc.).....	60	3	.4
		Under vested water rights.....	124	4	.9
		Total cropped area farms reported....	8,400	203	61.1

1906 is 1.20 inches. These figures are for the Savage station, and the precipitation on the lower end of the project has been, during the entire season, considerably in excess of that on the upper end of the project. On the 12th a hailstorm crossed over a strip about 6 miles wide, extending from Sidney north, and considerable damage was done to the crops, especially wheat. Unusually heavy winds were frequent.

At the end of the month 16,350 acres had been irrigated. The Main Canal has been in condition to carry a much larger quantity of water than needed at any time, although the cloudburst on the 12th in the vicinity of Ridgelaun filled the canal to overflowing. The water was promptly turned out at the various sluiceways and little damage resulted. Other than the small area damaged by the hailstorm, all crops in the valley were in excellent condition. The second cutting of alfalfa was being harvested at the end of the month and 75 per cent of the grain crops were in the shocks.

In addition to the routine work of operating and maintaining the system, the maintenance force installed 6 concrete drops, placed 9 new turnouts, and installed a concrete check and culvert in the Nohle Lake drain. The Ruth lateral dredger cleaned silt from one side of 19,900 lineal feet of laterals and completed cleaning 9,950 lineal feet of laterals. During the month this machine moved 9,854 cubic yards of material at a unit cost of 5½ cents per yard. From present progress being made with this machine the entire KK lateral system will be placed in its normal condition by the 10th of August.

The bids submitted under specifications 399 for Main Canal and lateral extensions were received at the project office on July 15. J. E. Hilton, of Sheridan, Wyo., was the lowest bidder, the average price per cubic yard being approximately 18 cents. It is expected that work on these canal extensions will be well under way by the middle of August.—L. H. Mitchell.

NORTH PLATTE PROJECT, NEBRASKA-WYOMING.

July weather was on the whole favorable. Showers occurred at intermittent intervals, but helped the crops very little.

Operation.—At the end of the month five valves in the South Tunnel of Pathfinder Dam were wide open to supply the demands of irrigation. The outflow for the month averaged 5,568 second-feet and the total amounted to 341,768 acre-feet.

The diversion into the Interstate Canal was increased from 1,575 second-feet on the 1st to 1,690 on the 10th, 1,730 on the 20th, and to 1,745 on the 28th. It was then reduced to 1,670 on the 31st on account of rains.

The High Line Canal was running to capacity at the end of the month—220 second-feet. The flow of the Low Line was steady throughout the month, remaining at about 330 second-feet. The demand for water was heavy throughout the entire month.

Deliveries under the Fort Laramie Canal did not require the average diversion to exceed 373 second-feet for the month. The diversion varied from 457 on the 9th to 188 on the 31st.

At the end of the month 22 second-feet were being delivered to the Willis Lateral on the Northport Division. This amount was sufficient to supply the demands for irrigation purposes.

Maintenance work on both divisions was confined to routine maintenance and repair work. On the Interstate Division dragline No. 122230 continued work on the Interstate Canal banks, moving 13,330 cubic yards of material, or an average of 513 cubic yards per shift.

Crops.—No crops were disposed of during the month. Generally speaking, the crops were good. About 40 per cent of the second cutting of alfalfa has been harvested and 90 per cent of the grain. Thrashing of winter wheat had begun. The potato and beet crops were in excellent condition and were being

Crop report, irrigated farms., Greenfields Division, Part 1, Sun River project, Montana, 1920.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	383	Ton.....	521	1.36	\$10.00	\$5,210	\$13.60
Barley.....	153	Bushel.....	3,264	21.3	1.00	3,264	21.30
Clover hay.....	8	Ton.....	5	6	10.00	50	6.25
Flax.....	735	Bushel.....	4,663	6.3	1.20	5,600	7.55
Garden.....	18	.....	.....	.....	200.00	3,700	200.08
Hay (except above).....	382	Ton.....	404	1.06	10.00	4,040	10.55
Oats.....	672	Bushel.....	14,082	20.9	.70	9,830	14.60
Pasture.....	319	.....	.....	.....	3.00	957	3.00
Potatoes.....	49	Bushel.....	5,581	113	.70	3,910	79.00
Rye.....	10	do.....	160	16	1.00	160	16.00
Wheat.....	5,200	do.....	59,766	11.5	1.25	74,710	14.38
Sunflowers.....	12	Ton.....	60	5	5.00	300	25.00
Miscellaneous.....	9	.....	.....	.....	.....	269	.....
Total cropped.....	7,950	Total and average.....				112,000	14.08

		Areas.	Acres.	Farms.	Per cent of division.
Acres irrigated on 151 farms.....	6,690	Total irrigable area farms reported.....	16,968	151	67.9
Miscellaneous.....	40	Total irrigated area farms reported: Under rental contracts.....	6,690	151	26.8
Total irrigated.....	6,730	Total cropped area farms reported....	7,950	151	31.8

irrigated for the second time. Considerable spraying had been done to potatoes on account of bugs, but beets required spraying in only a few places.

Drainage.—Dragline No. 122229 continued work on the Minatare Drain throughout the month, operating two 8-hour shifts daily; 19,430 cubic yards of material were moved, at an average of 452 cubic yards per shift.

Dragline No. 121157 continued operations on the Dutch Flats area with two shifts daily and making good progress. During the month 13,160 cubic yards of material were moved, averaging 321 cubic yards per shift.

On the Fort Laramie Division electric dragline No. 131313 continued work on Branch B of the Cherry Creek Drain, making excellent progress with two 8-hour shifts daily; 40,157 cubic yards of material were moved, averaging 762 cubic yards per shift.

Construction.—Storage Division: Work continued throughout the month on the excavation for the valve-house cave for the North Tunnel outlets. Two shifts were worked daily. The total excavation for the month amounted to 665 cubic yards of class 3 material. No concrete was placed.

Fort Laramie Division: Three of the electric draglines were at work on the Fort Laramie Canal in Wyoming, each operating two shifts daily. The total yardage moved during the month was 106,330 cubic yards of material, completing 1.6 miles of canal.

Dragline No. 121150 was engaged throughout the month in lining the lower bank of the Fort Laramie Canal; 9,340 linear feet of bank were lined during the month.

The powder crew, averaging six men and one Ford truck, drilled 3,825 linear feet of holes and used 6,175 pounds of T. N. T. in blasting classified material on the Fort Laramie Canal.

Good progress was made on the construction of canal and lateral structures by Government forces. Work continued on the Upper Cherry Creek Valley structures. An excellent showing was made on structures in the Second Lateral District. A number of contracts for hauling gravel, earthwork, and construction of structures have been let and good progress has been made on nearly all the contracts now in force. The prices bid still remain at the low level established in previous months.

Northport Division: The excavation of the Northport Canal was continued by the electric dragline and the Bucyrus class 14 machine and the elevating grader outfit constructing fills ahead of the draglines. Construction forces made good progress on canal and lateral structures. Good progress was also being made on the several earthwork, gravel hauling, and structure contracts in force and preparations were being made to advertise for more work in the near future.

Power system.—The Lingle power plant was operated continuously with three shifts daily. In addition to the power used for construction purposes, 2,940 kilowatt hours were delivered to Lingle, Wyo., 35,600 to Torrington, Wyo., 7,900 to Morrill, Nebr., and 30,200 to Mitchell, Nebr.

Surveys.—The field parties have all been busy on lines and grades for construction work by Government forces and contracts and the preparation of new work for advertisement.—*E. E. MacDonald.*

NEWLANDS PROJECT, NEVADA.

July weather was very favorable for construction and farming operations. All crops made a phenomenal

growth, especially beets, cantaloupes, and garden produce. The harvesting of grain was well under way at the close of the month, as was also the second cutting of alfalfa.

Operation and maintenance.—The delivery of water was uninterrupted except for a few minor breaks in the lateral system and interruptions due to moss-eradication work. The outflow from Lahontan Reservoir was fluctuated between 630 second-feet and 1,089 second-feet to meet irrigation demands, the total outflow for the month being 57,370 acre-feet. The outlet gates at Lake Tahoe were opened on July 6 in order to maintain the vested Floriston rate of 500 second-feet. The outflow from this reservoir was gradually increased to 399 second-feet at end of month. Owing to falling off of flow in Truckee River the Lahontan power plant was switched onto the auxiliary take out from Lahontan Reservoir on July 7 in order that all available water might be used for irrigation purposes on Truckee lands. The river continued to fall rapidly until July 16, when with a discharge of only 157 second-feet a 5-day rotation schedule was put into effect on all lands under the Truckee Canal in order to distribute the available water as equitably as possible.

Construction.—Truckee Canal improvement work was resumed during the latter part of the month using Monaghan dragline No. 3 at the point where this work was discontinued last winter and with the shipping of the small Austin dragline to Thisbe, Nev., where it was taken across Truckee River to the head of Truckee Canal for cleaning out several earth slides resulting from cloudbursts several years ago. The two class 14 Bucyrus and the P. & H. dragline excavators for use on the proposed deep drainage system were received and assembled at the project yards.

Final location surveys for the proposed deep drainage system were started on July 14 with one transit and one level party in the field under the direction of Engineer A. W. Walker, who will have charge of drainage construction work.

Miscellaneous.—Considerable effort was being put forth by the farm bureau department toward organizing a local branch of the proposed Nevada State Marketing Association, the purpose of which is to insure a market for farm produce.

Drainage Engineer J. L. Burkholder visited the project from July 8 to 13 to formulate plans for the early commencement of drainage construction work.

On July 17 Mr. W. A. Keddie, an assistant engineer during the early construction of the project, and his pilot were killed at Elko, Nev., in an airplane accident. Mr. Keddie was an influential stockman and was a former State senator.

The project manager and the chief clerk enjoyed a vacation at California resorts from July 16 to 31.—*John F. Richardson.*

CARLSBAD PROJECT, NEW MEXICO.

The weather during most of July was hot and fair. There were several short periods of cloudy, sultry weather. The total run-off of the Pecos River at the Dayton Station amounted to 114,000 acre-feet. The maximum flow was about 4,000 second-feet, which occurred July 30. The minimum flow was 420 second-feet, at the beginning of the month.

Maintenance work was confined principally to chopping weeds and grass in the lateral system. An average force of 12 men, under the regular foreman, was employed at this work, except for one week, which was spent at Lake McMillan repairing a sink hole in the

main dam close to the outlet gates, and making minor repairs on the east embankment. Two small crews were employed part time in cleaning laterals.

Most of the second crop and part of the third crop of alfalfa hay were harvested during the month. The yields were large and the quality excellent. Only a small amount of hay was damaged by wet weather. Market for even choice hay was dull; the best price reported during the month was \$8 per ton f. o. b. project, with lower grades selling as low as \$6 per ton. The Indian corn crop, of which there is a larger acreage than usual, was in excellent condition. The cotton crop generally was in a thrifty condition, and was well advanced for this time of the year. The prospects for a high average yield were very good at the close of the month.

The water supply was large and water was being spilled throughout the month. The demand on the farms was large during the latter half of the month. The maximum run of water was delivered through the canal during that period. On account of the light demand for water and the necessity for killing moss, water was out of the canal from the 9th to the 14th, inclusive.

The topographic survey of the proposed Alamogordo Reservoir site was completed during the latter part of the month, and Richard McConnel, chief of field party, returned to the Denver office. A representative of a Kansas concern was on the project during the

latter part of the month trying to organize a local company to install an alfalfa meal mill at Otis. Owing to the bad financial condition of most of the farmers, it is doubtful if this proposition will be financed this season.—*L. E. Foster.*

RIO GRANDE PROJECT, NEW MEXICO-TEXAS.

July weather was normal. On the 8th a rainfall of 1.7 inches occurred in one hour. Rains in the drainage basin of the Rio Grande have caused an inflow into the reservoir of 164,085 acre-feet.

There were 50,984 acres irrigated, with a delivery of 28,944 acre-feet.

Three weed-cutting crews were employed a part of the month cutting weeds and grass along canal banks; 68.8 miles of canal banks were cut over. It will be necessary to cut the Johnson grass once, and probably twice more, before the close of the season. Flood waters from heavy rains in the hills washed out about 600 cubic yards of the bank of the Las Cruces Lateral and 300 cubic yards of the Rodey Ditch.

Harvesting of the second cutting of hay was completed and some sections of the project were cutting the third. The pear plant in the El Paso Valley opened on the 15th, and 20 loads were shipped, which is about 70 per cent of the total crop that will be harvested. In the Mesilla Valley cantaloupes were being harvested and a good yield was expected.

Consolidated financial statement, all projects, as of June 30, 1921.

DEBITS.	
Group 1, cash and commercial paper (includes \$664.53 in hands of other employees).....	\$73,218.72
Group 2, inventories of stocks on hand.....	1,540,775.37
Group 3:	
Plant and equipment—	
Construction and operation and maintenance.....	\$2,976,604.14
Contributed work.....	974.48
	2,977,578.62
Group 4:	
Accounts receivable—	
Construction.....	1,091,185.90
Operation and maintenance.....	1,383,398.96
Miscellaneous.....	693,523.96
Supplemental construction.....	33,595.80
	3,201,709.62
Group 5:	
Deferred accounts receivable.....	69,033,365.52
Less construction charges advanced.....	122,934.75
	68,910,430.77
Group 6, unearned value of contracts.....	513,545.48
Group 7:	
Construction cost to United States....	127,236,635.77
Work performed by others.....	403,528.00
Supplemental construction.....	3,478,752.41
Operation and maintenance during construction.....	8,370,284.31
Operation and maintenance added to construction.....	278,644.92
Unadjusted clearing accounts.....	99,117.28
Gross construction cost.....	139,866,962.69
Less revenues and cost adjustments....	9,502,225.58
	130,364,737.11
Group 8:	
Operation and maintenance cost to United States.....	13,934,481.38
Work performed by others.....	1,503.86
	13,935,985.24
Less operation and maintenance added to construction.....	278,644.92
	13,657,340.32
Add unadjusted clearing accounts....	6,565.01
	13,663,905.33
Less revenues and cost adjustments....	10,275,219.35
	3,388,685.98
Total debits.....	210,970,681.67

CREDITS.	
Group 9:	
Accounts payable, except labor.....	682,369.04
Unpaid labor, credits.....	\$5,542,988.90
Unpaid labor, debits.....	5,236,500.07
	305,488.83
Total unpaid labor.....	988,857.87
Group 10:	
Contingent and deferred obligations—	
Unearned value of contracts.....	513,545.29
Engineering expense for work.....	
Contracted and undelivered orders.....	
Guarantee and special deposits.....	72,554.19
With fiscal officers.....	586,099.48
Group 11, resources for re-paying construction costs.....	82,653,789.51
Group 12, reserves.....	847,291.82
Group 13:	
Reclamation fund—	
Disbursement vouchers.....	159,843,380.99
Transfer vouchers.....	8,270,684.85
	168,114,065.84
Less collection vouchers—	
Construction.....	10,737,537.80
Operation and maintenance.....	7,902,460.47
Miscellaneous.....	16,513,206.95
Transfers.....	8,376,444.96
	45,529,650.18
	122,584,415.66
Increase of compensation:	
Disbursement vouchers.....	1,870,663.43
Transfer vouchers.....	99,950.76
	1,970,614.19
Less collection vouchers.....	9,021.42
Transfers.....	101,484.09
	110,505.51
	1,860,108.68
Special appropriations—	
Court of Claims and Rio Grande Dam.....	1,450,210.43
Less collection vouchers.....	91.78
	1,450,118.65
Total credits.....	210,970,681.67

Chief Engineer F. E. Weymouth and Engineer James Munn visited the project office on July 7, discussing the appropriation and allotment for the fiscal years 1922 and 1923.

Concreting on the spillway channel at Elephant Butte was continued throughout the month. At present this feature is requiring heavier expenditures than any other one feature. Other construction work consisted principally of the operation of drag-line excavators and construction of pertinent structures. The excavator working in the Rincon Valley was closed down on account of insufficient funds to continue the operation of this machine during the coming year. In the Mesilla Valley three drag lines continued the drainage construction and a small P. & H. machine operated on lateral construction; 2.3 miles of drain and 0.7 mile of laterals were constructed. In the El Paso Valley two Bucyrus excavators and the Jennings Engineering & Construction Co. contract machine continued drainage construction, while the Bucyrus 30-B continued on canal reconstruction and the small P. & H. machine the lateral construction; 1.2 miles of drain, 0.6 mile of lateral, and 1½ miles of the Franklin Canal banks were reconstructed.—*L. M. Lawson.*

Prevailing crop prices at close of July, 1921.

Project.	Alfalfa hay, per ton.		Barley, per bushel.	Oats, per bushel.	Wheat, per bushel.	Potatoes, per bushel.
	In stack.	Baled at shipping point.				
Salt River.....	\$3-88	\$10-12	\$0.58	\$0.45	\$1.25	\$1.35
Yuma.....	6.00	10.00	.41		1.50	
Orland.....	5.50	8.50	.55		1.02	
Grand Valley.....	8.00	11.00			.75	.60
Uncompahgre.....	5-6		1.25	.50	1.25	1.10
Boise.....	4.00	8.00	.35	.50	.75	.55
King Hill.....	6.00			.45		.60
Minidoka.....	4.00	8.00	.45	1.00	.60	.60
Huntley.....	10.00				1.00	
Milk River.....			.50	.50	1.18	2.40
Sun River.....	6.00	10.00	.70	.75	1.24	1.80
Lower Yellowstone.....	6.00		.60	.35	1.21	1.20
North Platte.....						
Newlands.....	7.00	10.00			.90	1.20
Carlsbad.....	6.00	7-8		.70	1.00	
Rio Grande.....		10-15		.60	1.05	
North Dakota pump- ing.....	15.00			.40	1.28	3.00
Umatilla.....		10.00				
Klamath.....	8.00	14.00	.48	.40	.90	
Belle Fourche.....	6.00	10.00	1.00	.40	1.10	3.50
Strawberry Valley.....	7.50	9.50	.70	.60	.90	
Okanogan.....	18.00					1.00
Yakima:						
Sunnyside.....		9-12				.60
Tieton.....		9-12				.60
Riverton.....						
Shoshone.....						
Indian projects:						
Blackfeet.....	10.00		.19	.13	.96	
Flathead.....	8-10	12-14		.97	1.30	1.50
Fort Peck.....				.17	1.39	2.00

NORTH DAKOTA PUMPING PROJECT.

Generally speaking, the weather was good for all operations. The normal precipitation record was again exceeded. The total precipitation for the month was 2.35 inches, being 0.32 inch above normal. The rainfall in June and July totaled 8.03 inches, well distributed. The surplus for the year is 2.75 inches. The temperature averaged 70° or 0.6° above normal.

The Missouri River gradually receded from 17 feet at the first of the month to 1.3 feet at the close of the month and its channel, which had threatened to leave the intake station, appeared to have been rescored during the high water. Extensive changes, however, were still going on in the river channel and the ultimate change is in doubt.

A hailstorm crossed the project July 12 and seriously damaged some of the crop, the principal damage being limited to a tract 1 mile wide across the project.

Owing to the evenly distributed rains water was pumped only during 17 days of the month, with the demand never exceeding 30 second-feet. The acreage irrigated was, of course, small, bringing the total for the season to about 1,200.

The changes in the Missouri River damaged the suction pipes of the city of Williston pumping plant and as a result no energy was used for city pumping for several days, with a consequent reduction in energy consumed in the corresponding month a year ago; 76,850 kilowatt-hours of energy was delivered to the city of Williston, which was 2,400 kilowatt-hours more than last month and 6,300 less than the same month of last year. The return was \$561 more than the same month last year.

One thousand four hundred and five tons of coal were mined.—*Wm. S. Arthur.*

UMATILLA PROJECT, OREGON.

July was especially cool, the mean temperature being 2.1° below the average for the previous 14 years.

Farming operations.—At the close of the month the second cutting of alfalfa was in the stack and many had irrigated the third crop for the first time. Some difficulty was being experienced by the farmers in securing the necessary hay hands, probably owing to the heavy wheat harvest starting in other parts of the county. Fifty-four cars of hay, approximately 4 tons of honey, and 1 car of wool were shipped during the month.

Labor conditions.—Although operations were limited, a little difficulty was realized in securing full crews. This is a temporary condition and due entirely to local harvesting operations.

Operation and maintenance.—The Feed Canal was not operated for storage during the month. Water was delivered to the Echo Mills from July 1 to July 5 and from the 11th to the 15th, from 25 to 38 second-feet being diverted and delivered. At the close of the month the available storage at Cold Springs Reservoir was 21,750 acre-feet, being approximately the same as on the same date the previous year. From 275 to 338 second-feet were diverted continuously by Canal A, from 20 to 39 second-feet by the Maxwell Canal, and from 140 to 150 second-feet by the West Extension Main Canal. The demand for water decreased somewhat during the month and no serious operation difficulties were encountered. In marked contrast to the previous year, exceptional efforts have been necessary in combating moss and weeds in canals.

General maintenance on the East and West Divisions was carried on by from two to four small crews, the principal work being the combating of weeds and moss, the remodeling of spillway No. 2 on the Feed Canal, replacements of old wooden turnouts with concrete, and replacement of the wooden fishway at Three-Mile Falls with a concrete structure.

Construction.—West Side Division: 1,780 linear feet of 12-inch and 15-inch concrete pipe were laid

and 10 minor structures installed on laterals Nos. 2, 3, 4, 4a, and 4b under supplemental construction. Four minor structures were installed on lateral No. 10 under original construction.

East Side Division, supplemental construction: 5,254 linear feet of 16-inch and 20-inch concrete pipe were laid, 875 linear feet of small lateral were lined, and 12 minor structures were installed. One No. 30 metal flume, 69 feet in length, was installed in district No. 22.—*Maurice D. Scroggs.*

KLAMATH PROJECT, OREGON-CALIFORNIA.

July was clear and warm with no precipitation. All crops on the project farms were in excellent condition. The harvesting of the first cutting of alfalfa hay was completed about the middle of the month.

Three crews were engaged about half the time in dragging project canals and laterals to remove moss growth. During the month several minor breaks occurred; the largest interruption in water deliveries was two and one-half days. A total of about 12,000 acre-feet of water was delivered to the farmers.

The survey party engaged in making the location surveys for canals and laterals in the Tule Lake Division completed the work on the 13th. One survey party was engaged all month on field work in connection with the precast flume on the C Canal.

Good progress has been made on the construction of the precast flume for the C Canal. The total length of the flume is 4,300 feet. At the end of the month the job was 84 per cent complete. The concrete placed in the precast units during the month amounted to 722 cubic yards and the total to date to

2,187 cubic yards. The excavation for the C-G Canal has been completed, also the major portion of the excavation for the structures at the Lost River crossing.

On the J Canal excavator No. 122235 excavated the material from the canal section and constructed the lower bank from station 244+70 to 312, which required the excavation of 22,297 cubic yards of material. Excavator No. 121478 was engaged in excavating material for the Lost River structures on the C-G Canal and in moving to the J Canal. Excavator No. 121248 constructed the 2-D Drain for the Upper Van Brimmer Drainage District and cleaned 10,715 feet of the No. 8 Drain.

W. D. Miller, who has the contract for the construction of the Lower Diversion Dam on Lost River, moved his equipment to the job during the latter part of July and began excavating on the 28th.

In the construction of the Link River Dam the California-Oregon Power Co. employed a crew of about 80 men. Operations were confined to the east side of the river, where a cofferdam was constructed and the river flow diverted to the west side. Work was begun in excavating for the foundation; no concrete was placed during the month.—*Herbert D. Newell.*

BELLE FOURCHE PROJECT, SOUTH DAKOTA.

With the exception of the 1st and 2d and the 26th and 27th, when light rains occurred, the month of July was marked by unusually hot and dry weather. The demand for water, consequently, was very great. Beginning with the 11th for a period of two weeks

Comparison between operation and maintenance estimates and results, Jan. 1 to July 31, 1921.

Project.	Gross cost.				Accruals.				Area which can be irrigated, 1921.
	Estimate for 1921.		Actual cost to July 31.	Amount *over or under.	Estimate for 1921.		Actual returns to July 31.	Amount more or *less than estimate.	
	Total for year.	To July 31.			Total for year.	To July 31.			
Belle Fourche.....	\$118,500	\$80,000	\$74,000	\$6,000	\$148,000	\$90,000	\$57,000	*\$33,000	Acres. 82,800
Boise.....	345,000	202,000	237,300	*35,300	321,500	259,000	183,000	*76,000	165,800
Carlsbad.....	50,000	33,000	36,000	*3,000	52,000	38,000	30,500	*7,500	25,000
Grand Valley.....	60,000	34,000	36,000	*2,000	61,400	35,000	36,000	1,000	38,350
Huntley.....	75,000	46,000	45,000	1,000	88,600	60,000	38,000	*22,000	31,300
King Hill.....	29,000				29,000				16,000
Klamath.....	75,000	52,000	51,000	1,000	87,900	58,500	60,500	2,000	52,500
Lower Yellowstone.....	66,000	42,000	39,000	3,000	66,000				38,700
Milk River.....	90,000	44,000	45,000	*1,000	45,000	34,000	12,000	*22,000	2 74,500
Minidoka (South Side).....	134,000	77,000	70,000	7,000	134,000	81,000	65,000	*16,000	49,000
Newlands.....	118,700	80,000	78,400	1,600	120,600	84,000	82,000	*2,000	69,300
North Dakota, pumping.....	59,050	37,500	31,700	5,800	26,800	18,000	18,000	0	7,650
North Platte—Interstate.....	275,000	177,000	198,000	*21,000	342,800	168,000	129,000	*39,000	3 129,900
North Platte—Fort Laramie.....	63,000	40,500	29,000	11,500	24,000	20,500	20,000	*500	14,000
Okanogan.....	35,000	21,500	25,000	*3,500	41,700	32,000	35,000	3,000	8,000
Orland.....	35,000	17,600	24,600	*7,000	41,200	28,000	28,000	0	20,500
Rio Grande.....	242,500	173,000	169,000	4,000	249,000	220,000	154,000	*66,000	118,000
Shoshone.....	108,600	68,000	59,000	9,000	126,000	87,000	75,000	*12,000	65,800
Strawberry Valley.....	*30,000	18,000	16,000	2,000	60,300	45,500	26,000	*19,500	59,100
Sun River—Fort Shaw.....	20,000	14,000	14,800	*800	26,400	19,300	18,500	*800	12,200
Sun River—Greenfields.....	25,000	17,000	25,800	*8,800	15,000	15,000	13,500	*1,500	25,100
Umatilla.....	53,000	35,000	34,000	1,000	53,000	36,200	40,000	3,800	26,300
Uncompahgre.....	145,000	88,000	102,000	*14,000	152,300	105,000	63,000	*42,000	100,000
Yakima—Sunnyside.....	135,000	80,600	85,000	*4,400	150,500	100,000	98,000	*2,000	110,800
Yakima—Tieton.....	92,000	52,000	54,300	*2,300	103,200	72,000	68,000	*4,000	32,000
Yuma.....	233,000	160,000	200,000	*40,000	300,000	200,000	176,000	*24,000	61,300
Total.....	2,712,350	1,689,700	1,779,900	*90,200	2,866,200	1,906,000	1,526,000	*380,000	1,433,900

* Report not received from project in time for publication.

2 Stored water is furnished through Saint Mary Canal for 21,600 acres additional.

3 Includes 17,000 acres for which water is carried in main canal.

* Does not include Strawberry Tunnel repairs.

both North and South Canals were run at capacity, the North Canal carrying 625 second-feet and the South Canal 320 second-feet. About 420 second-feet were passing the Indian Creek Flume, which is the greatest amount this structure has carried to date. Hydraulic jumps occurred in the flume at two places, one of which subsided when the flow was at the maximum. A lowering of the grade in the downstream half of this flume two years ago has enabled it to take care of a much larger flow than previously. It is planned to raise the upper half of the flume this fall, which should materially increase the capacity when completed. Rotation was practiced on the South Canal for about 10 days in order to make satisfactory delivery, and a slight shortage occurred in the lower district under the North Canal when the artesian pressure on the balanced valve gates failed to control the flow. This resulted in an irregular delivery through the gates, which showed up in a more pronounced way in the lower end than anywhere else. A force pump and engine were installed to control the pressure, after which no trouble was experienced.

At Orman very little maintenance work was done and only a small crew was employed. The reservoir had reached the point where it stood during the winter season when the lake was covered with ice. It was found that certain blocks in two or three places had been affected by the ice, and the grouting between blocks had come out, thus allowing a certain amount of sluicing of gravel underneath. The blocks in these places became irregular in position and in one instance a corner broke off. It was found that gravel had been sluiced out underneath the paving to the top of the dam, thus leaving an open space some 3 feet wide and a foot and a half deep. The grouting between the blocks covering this open space held the facing firmly in position and no damage occurred. Repair was made by breaking through the facing at intervals of about 15 feet and ramming gravel underneath to bring the gravel bed up to the facing. The holes were then sealed with concrete. Similar repairs on a smaller scale have been made each year since the blocks were reset, when the water was low.

The maintenance crew working out of Newell was engaged most of the month in making repairs and strengthening the banks of the North Canal where breaks and damage occurred during the heavy storm of 1920. Government teams only were used on this work. At Vale the regular crew of some eight or nine men was employed throughout the month in routine repair work and in constructing a concrete chute 300 feet long on the Craig Lateral, also rebuilding the Milberg Flume, which blew over in a heavy wind-storm. The chute required the use of 160 sacks of cement and 350 feet of lumber; the flume required 2,300 feet of lumber. The drag-line excavator began work on the Wilson cut on July 1. Several days were spent in repairing the machine, and on the 5th excavation work was resumed; 2,600 linear feet, comprising 3,450 cubic yards of earth, were moved in completing this cut. The machine was then moved to the deep cut on the Trude Lateral. The extra length of boom was required on this place. The length of the cut to be opened up was 1,375 feet and the amount of material 1,450 cubic yards, making a total of 4,900 yards for the month. This machine is giving satisfactory results. The Ruth dredger arrived on the 15th and was placed in service on the Town-site Lateral on the 29th. In two days of operation the machine cleaned 1,800 linear feet. The work accomplished by this machine is satisfactory, and it is believed that it will prove to be of much value in

cleaning laterals in heavy clay during the season of operation.

Crops on the project, where properly irrigated, made good progress, especially alfalfa and corn. The small-grain crops were somewhat adversely affected by the scorching sun, but where properly taken care of little damage occurred. A rather large area of small grains, however, will make less returns than should have been expected, owing to failure of farmers to irrigate as early as was required. Most cornfields were in first-class condition, although there were a few where irrigation was delayed to such an extent that the yield will be very light. The alfalfa seed crop was almost a failure, and a great many fields that were being saved for seed had been cut for hay. The sugar-beet crop and potato crop were good where the moisture was sufficient to cause proper germination early in the season; elsewhere the stand was poor and development not what it should be.

During July there were six camps on construction work, comprising 125 head of horses and 40 men. The amount of material moved was 30,581 cubic yards; approximately 25 per cent of the earthwork under Threet Bros. contract had been completed. Tucker Bros., contractors for the lower schedule, left on July 21, owing to some financial troubles with their bankers. On July 11 a group of subcontractors from Powder River, with 11 teams, took a subcontract for moving 15,000 cubic yards near the middle of schedule No. 1.—*B. E. Hayden.*

STRAWBERRY VALLEY PROJECT, UTAH.

Weather during July was generally fair and warm, with little precipitation.

Farming operations continued favorable throughout the month. The harvesting of grain and cutting of second crop of alfalfa had begun. The condition of all crops on the project was excellent and abundant yields were expected. Trouble with the webworm developed in the sugar beets on certain lands under the Spanish Fork Division. Prompt and effective steps on the part of the farmers, sugar company, and agricultural agents stamped out the threatened danger so that little damage resulted.

Hydrographic data.—The High Line Canal on the last day of the month was carrying 140 second-feet of water and Spanish Fork River was flowing approximately 160 second-feet. During the month a total of 21,483 acre-feet of water was delivered from Strawberry Reservoir for irrigation purposes; 12,131 acre-feet to the High Line Division; 6,077 acre-feet to the Spanish Fork Division; and 3,275 acre-feet to the Mapleton and Springville Irrigation Districts. The total amount of water delivered to the various divisions of the project from all sources was approximately 34,000 acre-feet, of which amount 21,483 acre-feet were delivered from Strawberry Reservoir.

Labor.—All classes of labor were plentiful for every requirement.

Operation and maintenance, storage system.—The usual patrol work was done and general supervision given all irrigation structures in connection with the storage works of the project by regular forces at East Portal.

The quarry operations continued throughout the month at West Portal and 150 cubic yards of rock obtained.

Grazing lands in Strawberry Valley maintained, on an average, 12,000 head of cattle and sheep throughout the month. At the close of the month the lands and stock were in excellent condition.

Operation and maintenance, power system.—The power plant was operated without interruption and

power furnished the towns of Spanish Fork, Payson, Salem, and Springville. Power Canal and Spanish Fork Diversion Dam were operated without trouble and all water required for irrigation and power purposes delivered. The telephone line between Indian Creek Dike and Strawberry Dam was dismantled and line from East Portal to Indian Creek Dike overhauled and telephone put in at one of the summer camps for public use.

Settlement.—During the month two water-right applications were received and accepted, both of which were new applications.

General.—Freighting contract was let for transportation of cement and miscellaneous supplies from Diamond Switch and power house camp to West Portal of Strawberry Tunnel.—W. L. Whittemore.

Project weather during July, 1921.

Project.	Station.	Temperature, °F.			Precipitation (inches).
		Maximum.	Minimum.	Mean.	
Salt River.....	Phoenix, Ariz.....	110	64	84.8	0.38
Yuma.....	Yuma, Ariz.....	111	64	91.3	.05
Orland.....	Orland, Calif.....	109	55	81.9	.....
Grand Valley.....	Grand Junction, Colo.....	98	47	77	1.38
Uncompahgre.....	Montrose, Colo.....	95	41	71.5	1.94
Boise.....	Boise, Idaho.....	103	40	74.1	T.
King Hill.....	Glens Ferry, Idaho.....	.....	.....	.....	.....
Minidoka.....	Burley, Idaho.....	100	36	70.6	.08
Huntley.....	Ballantine, Mont.....	102	40	73.4	.58
Milk River.....	Malta, Mont.....	102	47	70	3.48
St. Mary storage.....	Near Babb, Mont.....	92	31	60	1.93
Sun River.....	Fort Shaw, Mont.....	101	42	66.8	1.42
Lower Yellowstone.....	Savage, Mont.....	98	44	73	2.15
North Platte.....	Wynote, Wyo.....	99	45	71	1.77
Newlands.....	Fallon, Nev.....	101	38	74.2	.01
Carlsbad.....	Carlsbad, N. Mex.....	109	62	79.2	1.5
Rio Grande.....	El Paso, Tex.....	100	63	79.8	2.13
North Dakota pumping.....	Williston, N. Dak.....	96	47	70	2.35
Umatilla.....	Hermiston, Oreg.....	97	41	71.4	.05
Klamath.....	Klamath Falls, Oreg.....	94	36	69.5	.....
Belle Fourche.....	Orman, S. Dak.....	105	48	76	2.2
Strawberry Valley.....	Provo, Utah.....	97	32	71.1	.6
Okanogan.....	Omak, Wash.....	103	41	73.7	.....
Yakima:					
Sunnyside.....	Sunnyside, Wash.....	98	42	69.6	.....
Tieton.....	Cowiche, Wash.....	92	41	69.2	.....
Riverton.....	Diversion Dam, Wyo.....	96	40	70	.3
Shoshone.....	Powell, Wyo.....	99	40	72.3	T.
Indian projects:					
Blackfoot.....	Browning, Mont.....	88	33	57.8	.71
Flathead.....	St. Ignatius, Mont.....	98	42	66	.59
Fort Peck.....	Poplar, Mont.....	97	53	74.3	2.22

OKANOGAN PROJECT, WASHINGTON.

July was hot and dry, with winds which have greatly increased the evaporation.

The Robinson Flat pumping plant was operated continuously throughout the month, with the exception of two days, which were lost for the installation of further equipment. Power plant No. 2 was re-assembled and started on July 18, and ran continuously for the rest of the month for the purpose of boosting the voltage of the power company for balancing up the load. At the end of the month power plant No. 1 was started and was operated for two days with the idea of assisting the power company for one week, and each alternate week will be used in conjunction with No. 2 to operate a second unit at the Robinson Flat pumping plant. The master mechanic and one helper were busy throughout the month making repairs to machinery being operated and getting ready for the operation of the Salmon Lake pumping plant. Toward the end of the month a

third man was added to the mechanical force for the distribution of gravity water, and a force of from four to six men has been employed on maintenance and operation work. The office force has been busy getting out the annual report and keeping up the routine work.—Calvin Casteel.

YAKIMA PROJECT, WASHINGTON.

July weather was characterized by the lack of precipitation, none having been recorded at Sunnyside or Tieton, and only a slight amount at the reservoirs. Temperatures were about normal, days being bright and warm, with cool nights; considerable wind was experienced.

Construction, Storage Division.—A camp was located and preparatory work started on the piling of débris floating in Lake Keechelus. Gravel surfacing was done on the dam crest also.

Operation and maintenance, Sunnyside Division.—The average diversion from the river during July was 1,235 second-feet; the sluiceway in the dam was closed on the 16th, and flashboards on the crest were placed July 22. Some 40 second-feet were wasted, 10 second-feet being used for regulation at the end of the main canal and the balance for pumping-plant operation. Operation was without unusual incident. The pumping plants were operated throughout the month practically without interruption. Four small maintenance crews were cutting weeds and removing moss from the laterals and branch canals.

Tieton Division.—The Tieton Canal diverted an average of 326 second-feet from the Tieton River during the month, and a supplemental flow from the South Fork of the Cowiche Creek, varying from 12 second-feet on the 1st to 3 second-feet on the 10th. Only minor interruptions to service occurred, owing to failure of concrete pipe lines and an obstruction in the headgate to Lateral H. Three small repair crews were maintained, mainly cutting weeds on laterals and sublaterals, considerably reducing the losses in these ditches.

Storage Division.—The outlet gates at Kachess, Clealum, and Bumping Lakes were unchanged during the month, water passing over the spillways at Clealum and Bumping Lakes. The gates at Keechelus were raised on the 16th, allowing 400 second-feet to pass. This flow was gradually increased 1,800 second-feet on the 31st.

New divisions.—The field crew of 11 men were taking topography all month, covering 12,700 acres on the Roza Division.—J. L. Lytel.

TIETON DAM.

Work was continued on the construction of the Tieton Dam, Yakima project, during July, with an average force of about 325 men and 30 teams. Satisfactory progress was made on core-wall excavation, and at the end of the month the trench was being backfilled with concrete. The sand and gravel plant was nearly completed and the permanent power house No. 2 was placed in operation. The diversion tunnel was driven from the lower end only, a distance of 166 feet being made during the month. The freighting contractor began work on the 11th, hauling cement, equipment, and supplies from Naches to the dam. Work was in progress at the Russel ranch, harvesting about 100 acres of hay, which will be fed to stock working on the project. There has been no shortage of labor, though the hay and fruit harvests which are opening up in the Yakima Valley may take up the surplus. Excellent weather for construction work prevailed during the month.—F. T. Crowe.

RIVERTON PROJECT, WYOMING.

The temperature during July was about 3° higher than normal. The roads were in reasonably good condition throughout the month. Weather conditions were on the whole favorable for construction.

Dragline No. 121322 was operated two shifts throughout the month and was working on the Wyoming Canal near Mile 6, completing the excavation for a portion of the lined section during the early part of the month and later taking out the upper cut from the earth section. A portion of the material moved by this machine was so hard and compact as to require classification.

Dragline No. 121323 was working on the Wyoming Canal near Mile 1 building upper bank up to July 27, when it was taken across Wind River, and it then immediately began work on the temporary diversion of Wind River in order to permit excavation for the diversion dam. This machine was operated two shifts throughout the month.

Dragline No. 121474 was operated two shifts throughout the month, excavating loam from the earth section near Mile 1.

The total amount excavated from the Wyoming Canal by the three machines was 126,969 cubic yards, all of which was from the canal prism. Of this material 113,622 cubic yards comprised class 1 material, mostly a heavy loam, a few thousand yards being gravel, and 13,347 cubic yards class 2 material, a dense, compact clay; 3,327 cubic yards of gravel were also moved in excavating a temporary channel for Wind River.

The construction of the temporary bridge across Wind River was begun. Considerable clearing and grubbing was done at the site of the headworks, and other preparations made for active construction on this dam.—*H. D. Comstock.*

SHOSHONE PROJECT, WYOMING.

July was pleasant, well suited to growing crops, with warm but little excessively hot temperatures.

Water supply.—The Shoshone River has been receding steadily from the flood stage at the beginning of the month. On the 27th it was necessary to begin drawing on storage in the Shoshone Reservoir.

Operation and maintenance.—The principal work during the month was on the operation of the canal system. The canal was practically at full capacity from the 16th to the 21st; 32,000 acre-feet were delivered to the farms for the irrigation of 45,000 acres; 51,400 acre-feet were diverted at Corbett, and the maximum rate of diversion was 973 second-feet. Maintenance work consisted of repairing a break in a closed drain, inspection and cleaning of closed drains, riprapping canal banks, and the repair of a break near the lower end of the Deaver Canal occasioned by a weed jam at a structure and a break in Lateral A. Considerable work was also necessary on some of the larger laterals on the Garland Division in cleaning out moss, some of the laterals having been dragged twice.

Crops.—The weather has been good for all crops, except that rather hot weather at filling time may have lessened the wheat yield slightly. The harvesting of wheat on the Garland Division and oats on the Frannie Division was begun at the close of the month. The potato and sugar-beet crops looked excellent. There was practically no crop movement during the month and no established market price for produce; 2 cars of wheat and 1 car of oats of the 1920 crop were shipped.

Labor.—The labor situation continued satisfactory. **Drainage.**—The following tabulation shows the progress on drainage excavation during the month:

Machine.	No. and size of bucket.	Area.	Linear feet.	Cubic yards.	Shifts.
Bucyrus 9½.....	121324; 1½-yd.	North Garland....	5,585	26,627	52
Do.....	11128; 1½-yd.	Frannie, Part One.	4,633	25,120	50
Bucyrus 14.....	121472; 2½-yd.	North Garland....	7,242	44,453	54
Do.....	121475; 2½-yd.	Frannie, Part One.	5,946	29,339	54
Lidgerwood.....	113210; 1-yd.	South Garland....	3,880	23,456	53
P. & H.....	121161; 1-yd.	North Garland....	(1)	2,518	25
P. & H.....	121153; 1-yd.	Frannie, Part One.	(1)	4,600	25
Austin Trencher	42112.....	West Garland....	1,775	1,827	9
Total.....			29,061	157,970	322

¹ Recut.

Field and office engineering.—Field work was carried on by two crews on each the Garland and Frannie Divisions. One crew on each division was engaged on location of drains and structures in connection with drainage construction. One crew on the Frannie Division was engaged on topographic work for drainage and one crew on the Garland Division on the location of the transmission line from Shoshone Dam to Powell. Office work was mostly incidental to the above field work and preparation of reports.

Construction.—Construction work on the Garland and Frannie Divisions was confined practically to drainage work. A crew of the Chicago, Burlington & Quincy Railway worked the last of the month on the timber work for the trestle crossing of the main line and the Frannie Canal north of Frannie. When this structure is completed it will be possible to carry water to Part Four of that division and do the puddling and priming of the canal and lateral system for those lands.

At Shoshone Dam the principal work was completion of the trimming of the power tunnel, excavation of the channels in the tunnel for the drainage system, and excavation of the power-house site. The latter excavation consisted of 1,369 cubic yards of class 1 and 180 cubic yards of class 3 material.

Settlement.—Public notice has been issued covering the opening of 5,400 acres of lands in Part Four, Frannie Division, and Part Eight, Garland Division. Of this area, 3,667 acres are public lands in 57 farm units, 732 acres are Northern Pacific Railway lands, divided into 12 farm units, and the balance in State and private lands. Four farm units, comprising 271 acres of irrigable land, located near Ralston, constitute Part Eight, Garland Division. The rest of the area is in the Frannie Division, in the vicinity of Frannie town site. Veterans of the war with Germany have a preference right of 60 days to the entry of these lands. The date of the opening is September 12 to September 16, 1921. A large number of inquiries relative to these lands are being received.—*J. S. Longwell.*

INDIAN PROJECTS, MONTANA

BLACKFEET PROJECT.

Weather during June was unusually warm, with little precipitation. What local showers occurred did not interfere greatly with the work in progress, and helped somewhat in keeping the crops growing.

All four systems under the project were operated. A total of 5,454 acres was irrigated and 8,354 acre-feet of water were delivered to farms. The Two

Medicine Canal was operated to capacity the entire month, and it was impossible to deliver all of the water needed under this system at the right time, so that some crops suffered on this division, owing to the small capacity of the canal.

At the end of July about 14,000 acres had been irrigated this season and crop returns on a whole will be fair.

Most of the work during the month consisted of operation, but a small amount of maintenance work on Two Medicine Canal, the tearing down of an abandoned telephone line from Browning station to Kilroy, the moving of the operation and maintenance camp at Family to the Reclamation Service lot, and the partial remodeling of one of these buildings was also accomplished.—*R. M. Snell.*

Reclamation-fund transactions.

[Taken from Washington office records for the month of July, 1921.]

Treasury balance, June 30, 1921	\$3,560,930.04
Proceeds, sales of public lands	366,847.43
Deposits by fiscal agents (C/Ds)	136,962.69
Collections by auditor	16,013.08
Total credits	4,079,852.64
Withdrawals:	
Requisitions for fiscal agents	1,031,900.00
Auditor's settlements	52,702.81
Total withdrawals	1,084,602.81
Balance	2,995,249.83
June land sales (net) available in August	38,613.45
July land sales (net) estimated	150,000.00
Royalty oil furnished United States Shipping Board	283,799.97
Balance of funds with fiscal agents	784,724.20
Estimated total funds	4,252,387.45
Balance of funds in the Treasury, August 13, 1921, can not be ascertained at this time, for the reason that entries on the Treasury books have not been completed.	

FLATHEAD PROJECT.

At Pablo Feed Canal a turnout was placed by Government forces at Mike's Creek, involving 50 cubic yards of excavation, 7.2 cubic yards of rock masonry, and 143 cubic yards of earth fill.

At Dry Creek Canal excavation by Government forces was in progress at various points along the canal between stations 66+00 and 273+00, and amounted to 3,500 cubic yards, of which 2,730 were class 1 and 770 class 2. Work under contract 858 consisted of finishing canal sections between stations 192+25 and 189+00, a distance of 325 feet, and placing 13,458 square feet of concrete lining between stations 198+00 and 189+00, a distance of 900 feet.

Cutting of winter wheat was commenced early in the month, and thrashing was begun shortly before the close of the month. Many acres of oats were destroyed by grasshoppers and much of the remainder was being cut for use as hay. Cutting of timothy and clover hay was completed and hay was stacked in excellent condition. The second cutting of alfalfa was in progress at the end of the month.

Livestock continues in excellent condition.—*C. J. Moody.*

FORT PECK PROJECT.

July weather was favorable for construction work. The total precipitation for the month was 2.22 inches, which is about one-half inch above normal. Repairs to canals damaged by the June floods were completed,

but only a few gardens were irrigated, as grain was well along and making good growth from rains of June and July.

Placing of concrete for the siphon, station 628, Poplar River C Canal, continued throughout the month. The P. & H. one-half yard drag line worked throughout the month on Poplar River C Canal and made good progress.

Placing of farm turnouts on Big Muddy Division was continued with a small crew.

At the end of the month harvesting of grain crops was in full swing, and the yield is the best since 1916.—*S. A. Kerr.*

GENERAL OFFICES.

Washington office.—Director Davis left on July 8 for an extended trip through the West, probably returning in September. During his absence the office was in charge of Assistant Director Morris Bien as acting director, except for July 9, when, in the absence of Mr. Bien, Chief Counsel Hamel served as acting director.

Plans were perfected during the month for the opening on September 9 of 203 farm units on the Fort Laramie Division of the North Platte project and 20 units on the Interstate Division of the same project; and on September 16 of 57 units on the Garland and Frannie Divisions of the Shoshone project. A more detailed description of what was done will be found on another page of this issue.

Action was taken as indicated on the following letters submitted to the Secretary:

July 1, requesting that authority be granted to make award and enter into a contract with the Ford Motor Co. for approximately 150 standard-equipped motor vehicles and chassis for use on various projects; approved July 1.

July 13, recommending signing of order opening to entry on September 9, 1921, 203 public-land farm units, comprising 13,668.6 irrigable acres, on the Fort Laramie Division, North Platte project; approved July 14.

July 19, recommending signing of public notice opening to entry on September 16, 1921, 57 public-land farm units, comprising 3,667.08 irrigable acres, on the Garland and Frannie Divisions, Shoshone project; approved July 19.

July 19, recommending signing of order providing for the construction of a drainage system, Newlands project; approved July 30.

July 21, recommending signing of public notice opening to entry on September 9, 1921, 19 public-land farm units, comprising 1,165 irrigable acres, on the Interstate Division, North Platte project; approved July 21.

July 23, recommending approval of outline of contract with the water users under the jurisdiction of the Payette-Boise Water Users' Association, who are contemplating the organization of an irrigation district; approved July 30.

Among the visitors to the Washington office were the following: Dr. M. Abe, Tokyo, Japan, a leading man in reinforced concrete design and construction in Japan, who plans to visit several of the projects; S. Inaba, of the Imperial Japanese Navy; Edward C. Green, agricultural engineer, connected with the Brazilian Government at Natal, Brazil, who secured data in the interests of a large irrigation development planned in the States of Rio Grande de Norte and Parahyba, Brazil; Señors Juan C. A. Posse, Santiago

E. Fitz Simon, and Benjamin A. Reolin, engineers of the reclamation service of Argentina, who are visiting a number of our projects.

W. A. Meyer, examiner of accounts, arrived at the office on July 18, to remain about a month.

Denver office.—Chief Engineer Weymouth and Consulting Engineer Munn left on July 2 for a visit to the Yuma and Rio Grande projects, and on the return trip were met at La Junta, Colo., by Designing Engineer Savage and made an inspection of the flooded district in the vicinity of Pueblo. The director arrived in Denver July 17, and on the 19th he and Mr. Weymouth left for a trip to the field and spent the remainder of the month visiting the American Falls, Powder River, and Owyhee projects. Assistant Chief Engineer Walters left on July 30 to make an inspection of the Saratoga-Encampment project. Assistant Chief Engineer Williams and Drainage Engineer Burkholder visited the North Platte project from July 22 to July 28. Official visitors in the Denver office during July were Messrs. William M. Green and Andrew Weiss. Other visitors included A. L. Harris, consulting engineer, and F. A. Noetzi, chief designer, Beckman & Linden Engineering Corporation, and E. W. Michael, president of the Paradise-Verde Irrigation District.

The principal work accomplished in the Designing Section during the month consisted of designs for drops, Willow Creek lateral system, Belle Fourche project; designs for gates and repairs to temporary controlling works, Four Horns Reservoir, Blackfeet project; designs and estimates for rock fill dam, Boulder Canyon Reservoir; design of project office building, Fort Peck project; design of siphon and preparation of advertisement for lock-joint pipe forms, King Hill project; advertisement for gates and hoists, Klamath project; designs for turnout siphon and minor structures, Lower Yellowstone project; design of special measuring device, Dodson North Canal, Milk River project; miscellaneous designs for culverts, checks, siphons, and minor structures, North Platte project; revision of estimate of Mill Site Reservoir, Orland project; studies of various types of dams proposed by engineers of Paradise-Verde Irrigation District; topographic maps of upper and lower dam sites, Pecos River investigation; preparation of maps for Owens Valley project; preparation of maps, hydrographs, and other data for use in the Munn-Savage report, Pueblo flood investigations; designs for headworks, spillway, and minor structures, Wind River diversion dam, Riverton project; revision of design for vent pipe for gate house, Strawberry Tunnel, Strawberry Valley project; studies and estimates for stock and domestic water supply system, Uncompahgre Valley project; preparation of design of tunnel extension and foundation for trash rack structure at Tieton dam, Yakima project; revision of designs for the First Mesa distributing system structures and preparation of advertisements for metal flume and lock-joint pipe forms, Yuma auxiliary project. Work was continued on standardization drawings for lock-joint pipe forms, turnout gates, and radial gates. A complete revision was also made of the 1914 standard specifications.

The principal work accomplished in the Electrical Section consisted of the preparation of specifications for direct pumping units for the Thomas Point pumping plant, Lower Yellowstone project; studies relative to the revision of the present plan for distribution of power plant operating costs, North Dakota pumping project; studies relative to the proposed renewal of

the contract with the Platte Valley Telephone Co. and the proposed supplemental construction contract covering power development at the Guernsey Reservoir, North Platte project; studies relative to the proposed power development at Elephant Butte Dam, Rio Grande project; studies relative to the proposed construction of the power plant and distribution system, Riverton project; detail designs of Shoshone power plant, drawings of foundation and turbine floor; plans and specifications for the transmission line and distributing system, Shoshone project; specifications and drawings for pump installation at Sulphur Creek wasteway, Yakima project; preparation of specifications for structural steel for the B Lift pumping plant, drawings of general arrangement and studies relative to the installation of two additional pump units in the Yuma Valley drainage plant, Yuma project.

In the Legal Division a conference was held with the director and chief engineer relative to the question of relieving from assessment this year certain lands in Lower Yellowstone Irrigation District No. 1. Another matter discussed was commencement of construction on drainage on the Newlands project, notwithstanding the appeal of the suit confirming assessment of benefits in the irrigation district. Consideration was given to form of supplemental contract with the Okanogan Irrigation District, which is now necessary, due to the withdrawal of the district from the Methow-Okanogan Irrigation District, and also to the form of contract with the Klamath Drainage District, including the question of capitalizing the operation and maintenance charges for lands in the Van Brimmer Ditch Co. Contract was completed with the Bucyrus Co. for an electrically operated shovel for Tieton Dam, as was also supplemental contract with the Austin Machinery Corporation for ditch-cleaning machines. Various leases were prepared for lands in the proposed Marias project for grazing purposes.

An average of 391 letters per day was received during the month; 1,076 vouchers were handled, involving a total amount of \$366,698.30. In the purchasing division 395 advertisements were issued and 493 vouchers prepared, involving a net expenditure of \$199,954.55. Transfers were effected between the projects amounting to \$2,485.58.—*Chas. P. Williams.*

JOHN HILLERY ACCIDENTALLY KILLED.

On the night of August 1, John Hillery, employed as drill runner on the Shoshone project, was instantly killed when he drilled into a missed shot while at work in the tunnel at Shoshone Dam.

Mr. Hillery came to the project from Butte, Mont., and had been employed since July 17.

The sympathy of the service is extended to his relatives in Butte, Mont., to whom his body was shipped.

The RECORD contains much valuable information for irrigation engineers as well as for irrigation farmers. It fills a place not taken by any other publication.—*W. L. Rockwell, irrigation engineer, Austin, Texas.*

ADMINISTRATIVE ORGANIZATION.

DEPARTMENT OF THE INTERIOR.

Hon. ALBERT B. FALL, Secretary of the Interior.
 EDWARD C. FINNEY, First Assistant Secretary.
 FRANCIS M. GOODWIN, Assistant Secretary.
 EDWIN S. BOOTH, Solicitor for the Interior Department.
 CHARLES V. SAFFORD, Administrative Assistant to the Secretary.
 CHARLES W. NESTLER, Administrative Assistant to the Secretary.
 HARRY G. CLUNN, Private Secretary to the Secretary.
 JOHN HARVEY, Chief Clerk and Superintendent of Buildings.

U. S. RECLAMATION SERVICE.

WASHINGTON, D. C.

Arthur Powell Davis, director; Morris Blen, assistant director; Ottamar Hamele, chief counsel; J. B. Beadle, director's assistant; C. J. Blanchard, statistician; Hugh A. Brown, editor and office assistant; C. A. Bissell, engineer; A. H. Gullickson, chief accountant; Miss H. A. Fellows and Raymond Depue, fiscal agents; C. H. Fitch, chief clerk; Emmet Carr, purchasing agent; G. W. Numbers, appointment clerk; H. N. Bickel, Yakima, Wash., W. A. Meyer, Denver, Colo., and W. F. Kubach, Great Falls, Mont., examiners of accounts.

DENVER, COLO.

F. E. Weymouth, chief engineer, Tramway Building, Denver, Colo.; R. F. Walter and C. P. Williams, assistant chief engineers; Miss L. H. Melsel, secretary to the chief engineer; J. M. Gaylord, electrical engineer; J. L. Savage, designing engineer; James Munn, consulting engineer; J. L. Burkholder, drainage engineer; W. L. Drager, office engineer; J. M. Loney, chief clerk; A. McD. Brooks, purchasing agent; Harry Caden, special fiscal agent.

FIELD LEGAL OFFICES.

Boise, Idaho.—B. E. Stoutemyer, district counsel. Projects: Boise, Minidoka, King Hill, and Jackson Lake Enlargement; R. M. Patrick, district counsel located at American Falls, Idaho.

Denver, Colo.—Law section office of chief engineer: E. E. Roddis and Armand Offut, district counsel; J. J. Buck, assistant district counsel.

El Paso, Tex.—P. W. Dent, district counsel. Projects: Rio Grande, Carlsbad, and Hondo.

Las Cruces, N. M.—Mark B. Thompson, attorney in charge of litigation on Rio Grande and Carlsbad projects.

Helena, Mont.—W. J. Egleston, district counsel, Helena, Mont. Projects: Blackfeet, Flathead, Fort Peck, Huntley, Milk River, St. Mary Storage, Sun River, North Dakota Pumping, Lower Yellowstone, and Shoshone.

Mitchell, Nebr.—J. N. Beardslee, district counsel. Projects: North Platte and Belle Fourche.

Montrose, Colo.—J. R. Alexander, district counsel. Projects: Grand Valley, Uncompahgre, and Strawberry Valley.

Portland, Oreg.—H. L. Holgate and D. G. Tyree, district counsel. Projects: Yakima, Okanogan, Umatilla, and Klamath.

San Francisco, Calif.—Henry A. Cox and A. B. Fullerton, district counsel, 349 Pacific Building. Projects: Salt River, Yuma, Orland, and Newlands.

PROJECT ORGANIZATION.

Belle Fourche Project.—B. E. Hayden, project manager, Newell, S. Dak.; R. C. Walber, chief clerk; August Lewin, fiscal agent.

Boise Project.—J. B. Bond, project manager, Boise, Idaho; E. R. Mills, chief clerk; C. F. Weinkauff, fiscal agent.

Carlsbad Project.—L. E. Foster, project manager, Carlsbad, N. Mex.; V. L. Minter, chief clerk and fiscal agent.

Grand Valley Project.—S. O. Harper, project manager, Grand Junction, Colo.; A. W. Walker, engineer; G. H. Murphy, chief clerk; A. H. Hall, fiscal agent.

Huntley Project.—A. R. McGinness, project manager, Ballantine, Mont.; G. H. Bolt, chief clerk; Miss M. C. Simek, fiscal agent.

King Hill Project.—Walter Ward, project manager, King Hill, Idaho; T. W. Hause, chief clerk; L. D. Eakin, fiscal agent.

Klamath Project.—H. D. Newell, project manager, Klamath Falls, Oreg.; N. G. Wheeler, chief clerk; G. R. Barnhart, fiscal agent.

Lower Yellowstone Project.—L. H. Mitchell, project manager, Savage, Mont.; C. A. Denman, chief clerk.

Milk River Project.—G. E. Stratton, project manager, Malta, Mont.; E. E. Chabot, chief clerk; G. S. Moore, fiscal agent.

Minidoka Project.—Barry Dibble, project manager, Burley, Idaho; Dana Templin, engineer; E. C. Diehl, chief clerk; Miss A. J. Larson, fiscal agent; F. A. Banks, engineer, American Falls, Idaho.

Newlands Project.—J. F. Richardson, project manager, Fallon, Nev.; G. B. Snow, chief clerk and fiscal agent.

North Dakota Pumping Project.—W. S. Arthur, project manager and chief clerk, Williston, N. Dak.; H. C. Melaas, fiscal agent.

North Platte Project.—Andrew Weiss, project manager, Mitchell, Nebr.; H. W. Bashore, engineer, Fort Laramie Division; Paul Rothl, irrigation manager; J. R. Ummel, chief clerk; Miss A. L. Perrine, fiscal agent.

Okanogan Project.—Calvin Casteel, project manager, Okanogan, Wash.; W. D. Funk, chief clerk and fiscal agent; H. J. Gault, engineer, Conconully Wash.

Orland Project.—R. C. E. Weber, project manager, Orland, Calif.; E. T. Eriksen, engineer; C. H. Lillingston, chief clerk and fiscal agent.

Rio Grande Project.—L. M. Lawson, project manager, El Paso, Tex.; T. W. Parry, irrigation manager; C. A. Peavey, chief clerk; L. S. Kennicott, fiscal agent.

Riverton Project.—H. D. Comstock, project manager, Riverton, Wyo.; R. M. Conner, engineer; G. H. Baird, chief clerk; J. C. Thrallkill, fiscal agent.

St. Mary Storage Division.—R. M. Snell, project manager, Brownling, Mont.; F. H. Shiner, chief clerk; H. E. Bruce, fiscal agent.

Salt River Project.—Being operated by the Salt River Valley Water Users' Association; C. C. Cragin, general superintendent and chief engineer, Phoenix, Ariz.

Shoshone Project.—J. S. Longwell, project manager, Powell, Wyo.; J. R. Iakisch, engineer; C. M. Jump, superintendent of irrigation; W. F. Sha, chief clerk; Miss L. C. Drinkwater, fiscal agent.

Strawberry Valley Project.—W. L. Whittemore, project manager, Provo, Utah; J. E. Overlade, chief clerk and fiscal agent.

Sun River Project.—G. O. Sanford, project manager, Great Falls, Mont.; H. W. Johnson, chief clerk; Miss M. G. Valentine, fiscal agent; G. A. Benjamin, irrigation manager, Fairfield, Mont.

Umatilla Project.—H. M. Schilling, project manager, Hermiston, Oreg.; M. D. Scroggs, superintendent of irrigation; G. C. Patterson, chief clerk and fiscal agent.

Uncompahgre Project.—L. J. Foster, project manager, Montrose, Colo.; A. H. Peach, chief clerk and fiscal agent.

Yakima Project.—J. L. Lytel, project manager, Yakima, Wash.; C. E. Crownover and C. F. Gleason, engineers; R. K. Cunningham, chief clerk; J. C. Gawler, fiscal agent; J. G. Heinz, engineer, Sunnyside, Wash.; J. S. Moore, superintendent of irrigation, Naches, Wash.; F. T. Crowe, engineer in charge construction Tilton Dam, Rimrock, Wash.; V. G. Evans, chief clerk; C. B. Funk, fiscal agent.

Yuma Project.—P. J. Preston, project manager, Yuma, Ariz.; R. M. Priest, superintendent of construction; S. A. McWilliams, engineer, Yuma Mesa Division; E. R. Scheppelmann, chief clerk; E. M. Philebaum, fiscal agent.

INDIAN PROJECTS.

Blackfeet Project.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk and fiscal agent.

Flathead Project.—C. J. Moody, project manager, St. Ignatius, Mont.; F. F. Smith and N. B. Hunt, engineers; J. M. Swan, chief clerk; J. P. Siebeneicher, fiscal agent.

Fort Peck Project.—S. A. Kerr, project manager, Poplar, Mont.; Henry Berryhill, chief clerk and fiscal agent.



ST. MARY STORAGE AND BLACKFEET PROJECT OFFICE AND EMPLOYEES.

Left to right: F. H. Shiner, chief clerk; R. K. McComb, engineer; J. Anderson, motor-truck driver; H. E. Bruce, stenographer and fiscal agent; H. L. Scott, assistant engineer; A. J. Booth, foreman; J. A. Koeper, bookkeeper; Stephan Kohles, corralman; R. M. Snell, project manager.

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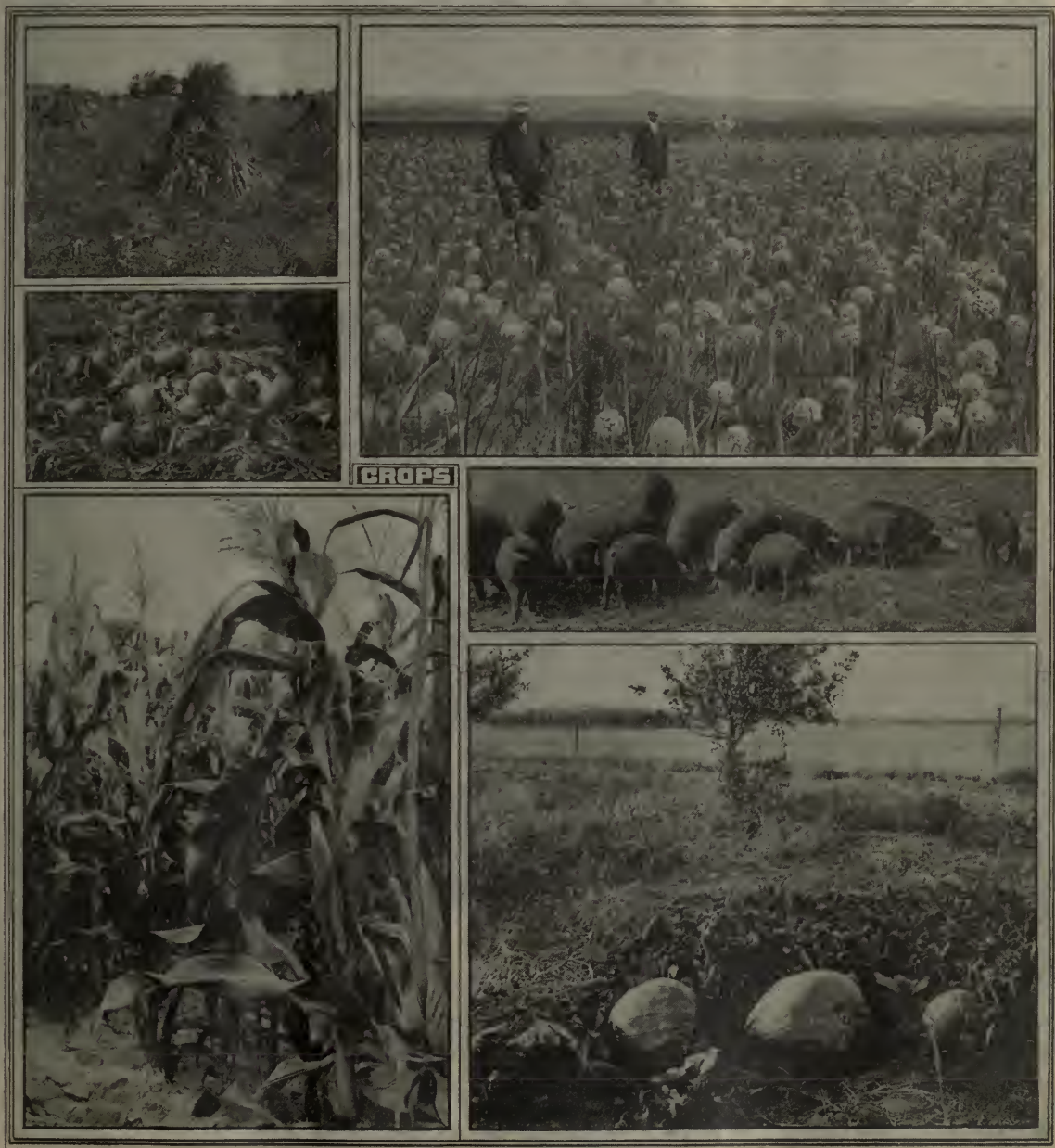
Better Farming : Better Business : Better Living

THERE CAN BE NO SURER INSURANCE FOR THE NATION THAN TO PUT ITS MEN UPON THE SOIL

VOLUME 12, No. 10

PRICE (FREE TO OUR WATER USERS
(SEVENTY-FIVE CENTS A YEAR TO OTHERS

OCTOBER, 1921



They grow 'em in Montana.



SCENES AT THE NORTH PLATTE OPENING.

Upper: The municipal camping ground with ex-service men who brought their own camping outfit to the opening.
Lower: In front of the court house showing some of the 3,436 ex-service men who filed applications for farms.

SECRETARY FALL APPRAISES RECLAMATION SERVICE.

During his recent visit to the Boise project and the Arrowrock Dam, Idaho, Secretary Fall said: "It is the kind of work I like to see the Government engaged in. I feel we are getting something for the money we had to expend here. In this line—reclamation work—I believe the Government is greatly efficient. I think the greatest beneficial work of the Government has been done through the activities of the Interior Department and its branch, the Reclamation Service."

NORTH PLATTE PROJECT LAND OPENING.

By C. J. Blanchard, Statistician, U. S. Reclamation Service.

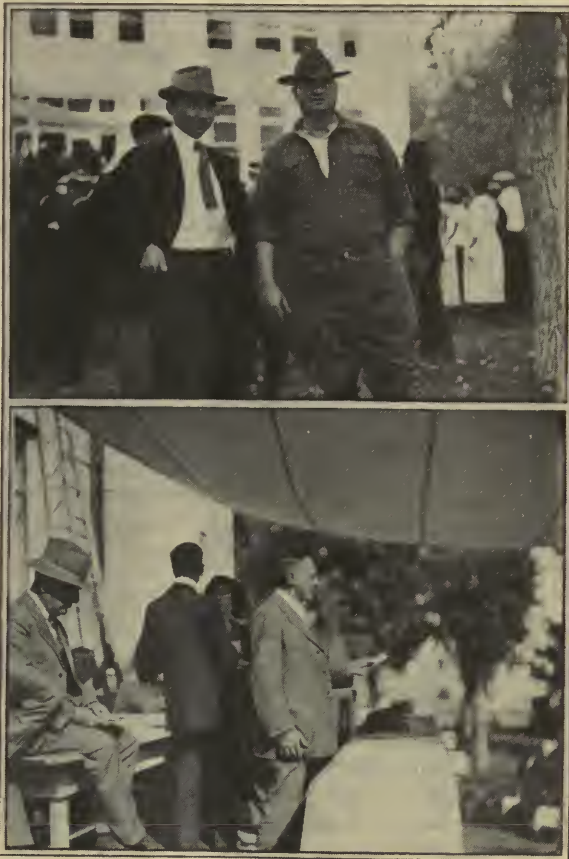
THE second opening of Government irrigated land on the North Platte project for ex-service men and women occurred on September 9 at Torrington, Wyo., and like the first opening in the spring of 1920 was an unqualified success. War veterans to the number of 3,436 and registering from 36 States, the District of Columbia, and Canada filed water-right applications for the 224 farms. In auto, prairie schooner, Pullman, day coach, airplane, on horseback, and on foot, the hosts of land-hungry heroes flocked to the bustling little city of Torrington, in the wonder valley of the North Platte.

Many of them bear the cruel marks of service on the historic battle fields of France, but most of them were strong, vigorous, and manly young Americans. All were cheerful, wishful homeseekers, and the majority were farm trained and experienced.

For days the Fort Laramie Division presented a scene of unusual activity. Hundreds of cars were in constant service transporting the land seekers up and down the valley while investigating the farm units. Every known type of auto was in evidence, and many were equipped with complete camp outfits, enabling the owners to stop at will in their travels to and fro.

Torrington's municipal camp ground contained several hundred of these outfits and at night was the scene of much frolic and fun. The ties of friendship found in service were evidenced by the little groups of men who had made the journey together from distant States and who confidently made their plans for the future beside the little camp fires in the park. More than half the entries were filed between Thursday afternoon and Friday morning at 9 o'clock, the closing hour. During the last 24 hours 2,136 applications were recorded, and the Reclamation Service employees were rushed to the limit. After the close of entries the entire force took up the work of preparing for the drawing at 2 p. m. Promptly to the minute Project Manager Weiss appeared on the courthouse steps and briefly explained the plan of drawing. He then introduced Gov. Carey, of Wyoming, who drew out the first envelope from the big wheel. With the announcement of the lucky soldier's name, T. T. Ziegler, Pleasanton, Kans., the big crowd which filled

the spacious park broke into cheers. Among the early winners of farms were W. D. Nichols, Washington, D. C.; H. T. Cully, Phoenix, Ariz.; Carl Fowler, Sackett, Pa.; Lee Cotton, Savannah, Ga.; E. I. Linderman, Houston, Tex.; J. A. Madden, San Francisco, Calif.; Theodore Gill, Appleton, Minn.; David J. Nelson, Chicago, Ill.; and L. S. Timpson, Salt Lake City, Utah.



Upper: The first lucky man, T. T. Ziegler, Pleasanton, Kans., at left, with another lucky ex-service man.

Lower: Project Manager Andrew Weiss calling second lucky number.

Nebraska and Wyoming citizens were represented largely among the lucky. There were several winners from Iowa, Kansas, Missouri, Oklahoma, and Colorado, so that the addition to the settlers on the Fort Laramie Division is very cosmopolitan. Among the successful applicants were Jennie B. Fuller, Graham, Nebr.; Florence O. Wheeler, Council Bluffs, Iowa; Hattie P. May, Smith Center, Kans.; and Nann'e A. Rhodes, Hutchinson, Kans., Army nurses.

Distribution, by States, of successful applicants, North Platte project drawing, Sept. 9, 1921.

	No.
Nebraska	95
Wyoming	46
Colorado	22
Kansas	20
Iowa	11
Oklahoma	5
Missouri	4
District of Columbia	1
Georgia	1
Texas	1
Pennsylvania	1
California	1
Minnesota	1
Utah	1
Illinois	1
Arizona	1
No address	11

Total 223

The method of handling the applicants was much more satisfactory than that employed a year ago and the drawing was conducted throughout without a hitch. Applicants who failed to draw were presented with their deposits immediately after the unit for which they had applied had been drawn out of the cylinder and many were able to depart on the evening train or by auto for their homes. All the units on the Fort Laramie Division were filed on and all but five on the Interstate Division were taken up. Application for the latter farms were filed before the close of the day. The Reclamation Service handled \$441,000 in deposits at the opening, in the form of postal money orders, certified checks, and bankers' checks. Very little cash was in evidence.

The unlucky applicants voiced their disappointment mildly and each expressed the hope that future openings would be for larger areas with correspondingly greater chance for winning a farm.

Many of the ex-service men declared their intention of looking the valley over with a view of purchasing land near their friends.

The general expression was that this valley is one of the finest they had seen on the long journey from the Middle West and South.

Torrington citizens deserve great credit for the excellent manner in which they handled the crowds. There were no complaints of exorbitant rates for rooms or meals.

PROJECT LAND VALUES.

THE following editorial from the Burley Bulletin is as pertinent to all our projects as to the Minidoka project, to which it specifically relates. The keynote of the editorial is that "the value of a farm depends primarily upon the farmer"—a truism too often lost sight of. Why is it that the crop returns show that half or more of our water users produce yields less than the average for the project as a whole? A certain percentage of men on each project produce crop yields one and one-half or more times the project average. These are classed as "excellent" farmers. The "good" farmers are those whose yields equal the project average but are less than one and one-half times the average. On the other side of the line are the "fair" farmers whose yields are half the project average but less than the average, and below them still are far too many "poor" farmers whose yields are less than half the project average. The accompanying table shows by projects the status of our water users in 1920, based on crop yields. The editorial and the table merit considerable study and thought.

The editorial follows:

THE VALUE OF OUR LAND.

What is land on the Minidoka project worth an acre? This is a question you hear every day, asked by men and women who desire information on the real value of our land, based upon actual returns from proper methods of farming.

There is but one way to answer the question, and that is by actual facts and figures upon production of the soil. When we begin to consider the value of land based upon actual production, we immediately find that an acre of irrigated land on the Minidoka project varies in value according to the manner in which it is farmed, and in proportion to the amount of intelligent labor done upon it. In other words, the value of a farm on the Minidoka project depends primarily upon the farmer.

This fact is demonstrated every year. In 1920, a bad year for farmers generally, we had land on the Minidoka project which lost the men who farmed it as much as \$20 an acre, and we had other land no better in quality, no more favorably located, and with the same water right, which brought the man who farmed it \$100 an acre, making the land worth

(Continued on page 453.)

Although the attendance fell below what was expected from the large number of inquiries received, it is explained by the provision which made relinquishment for one year impossible. This eliminated the speculator. The winners will be found on their farms at the earliest moment possible and a great deal of development is anticipated before the snow flies.

\$1,000 an acre, based upon actual returns. We are not speaking now in single acre tracts, but of farms of at least 40 acres.

On this basis we have the value of land upon the Minidoka project during 1920 figured at from \$200 less than nothing up to \$1,000 an acre. These are extreme values in both directions, but they are correct, figured upon actual production.

This year both crop conditions and prices are more favorable for the farmer and the value of land is correspondingly greater. There is probably not a 40-acre tract on the Minidoka project but what will pay farming operations this season. On the other hand, there are farms which will pay as high as \$150 straight through.

Status of water users, 1920, on United States Reclamation Service projects.

Project.	Total number of water users producing crops.	Number of water users whose crop yields per acre were—			
		Poor (less than half the project average).	Fair (half the project average, but less than the average).	Good (the project average, but less than one and one-half times the average).	Excellent (one and one-half or more times the project average).
Salt River ¹	1,230	176	425	545	84
Yuma.....	644	200	300	120	24
Orland.....	366	36	172	107	51
Grand Valley.....	1,588	277	645	329	337
Uncompahgre.....					
Boise ¹	117	15	42	43	17
King Hill.....					
Minidoka:					
South Side Pumping.....	915	91	421	284	119
Gravity Division ¹					
Huntley.....	601	151	255	110	85
Milk River ²	229	67	56	51	55
Sun River:					
Fort Shaw Division.....	203	28	72	81	22
Greenfields Division.....	150	57	41	44	8
Lower Yellowstone.....	492	108	159	138	87
North Platte:					
Interstate Division.....	1,325	510	349	198	268
Fort Laramie Division ¹					
Newlands ¹					
Carlsbad.....	363	72	191	74	26
Rio Grande.....	2,998	610	1,268	807	313
North Dakota Pumping.....	94	22	34	29	9
Umatilla.....	493	66	175	188	64
Klamath.....	513	34	72	296	111
Belle Fourche ¹					
Strawberry Valley ¹					
Okanogan.....	367	154	79	55	79
Yakima-Sunnyside.....	2,905	145	435	2,180	145
Yakima-Tieton.....	1,340	212	559	396	173
Shoshone.....	910	199	344	273	94
Total.....	17,843	3,230	6,094	6,348	2,171

¹ Date not furnished.

² Exclusive of Chinook Division; data based on value per acre of irrigating crops.

We had stated these conditions to emphasize the point that the value of the farm on the Minidoka project depends primarily upon the farmer, which is

true to a great extent anywhere. However, the possibilities here are practically unlimited. One farmer near Burley has already sold over \$2,000 worth of potatoes from 8 acres of land this season. Last year this same farmer's beets brought him over \$250 an acre; and he does not claim to have the best farm on the project. Farm land for farming purposes—not speculation in real estate—in 40-acre tracts, as 40 acres is enough for one man and 40-acre farms pay the biggest returns on the money invested, is worth on an average \$300 an acre to the man who wants to farm and make a home on the Minidoka project. This is an average value. Some men are making their land worth much more, and the value will gradually increase as the farms are cut up into 40-acre tracts, and a more intensive and diversified farming with the proper amount of dairying is practiced. The man who has a farm on the Minidoka project which is worth less than \$300 an acre is land poor, and our advice to him is to sell down to his working capacity. The quicker he does it the better it will be for him and the country.

ECONOMY AND EFFICIENCY.

Representative Committee Considers Methods.

Director Davis has authorized the appointment of a committee to investigate present business methods of the Reclamation Service in order to see if its efficiency can be increased. Each branch of the Service is represented on the committee as follows: James Munn, chairman; Barry Dibble, project manager, Minidoka project; P. W. Dent, district counsel, El Paso, Tex.; J. B. Beadle, director's assistant; and J. M. Luney, chief clerk Denver office.

In order to permit the committee to meet all the project managers, district counsel, and chief clerks in the shortest feasible time, an itinerary has been made which will permit the committee to meet all the above-named employees with the least time and travel.

In a general way the committee is authorized to consider all matters that would tend to increase the efficiency of the Service, and will devote considerable time to subjects which involve general expense, administrative charges, accounts, camp maintenance, motor vehicle operations, superintendence and accounts, engineering and inspection, and storehouse operations. The committee will be expected to suggest improved methods of handling the work of the Service and pointing out ways of preventing duplication of work wherever possible.

The hog turns a bushel of corn into about 10 pounds of pork, leaves most of the fertility of the corn behind him, and concentrates the bushel of corn into one-sixth the space.



WE quote from a recent interview with Hon. Lucian W. Parrish, Representative from Texas, the following:

"With an ever-increasing population the time will soon come when America will find herself hard pressed to furnish homes and farms for her citizens, and if we exercise the foresight of a far-seeing people we will make ample provision for sane and conservative irrigation and reclamation of nonproductive lands.

"Money spent in this manner is not wasted, but is wisely invested, and will bring to the Nation a manifold reward in the way of homes for its citizens and increased production."

FALL CIRCUIT FOR DISTRIBUTION OF FILM.

Requests for loans during September included the following: Bureau of Commercial Economics, Maryland Division; All Saints Church, New York City; Bethlehem Presbyterian Church, Salisbury Mills, N. Y.; Methodist Episcopal Church, Lebanon, Pa.; First Presbyterian Church, Harriman, Tenn.; American Red Cross, Washington, D. C.; M. E. Mattern, Archbold, Ohio; Nevada College of Agriculture, Reno, Nev.; Laurel Presbyterian Church, White Rock, N. C.; First Presbyterian Church, Jacksonville, Tex.; University of North Carolina, Chapel Hill, N. C.; E. F. Kotz, Syracuse, N. Y.; First Presbyterian Church, Whitehall, N. Y.; E. J. Ruliffson, Deansboro, N. Y.

NOTED HERE AND THERE.

Arizona, Salt River project.—C. D. Bowker for a number of years managed to eke out a fair living on a grain ranch of 100 acres near Phoenix, of which 90 acres was leased land. The enormous increase in land values in the valley, due to the growing of long-staple cotton, put rents too high for grain growing, so that Mr. Bowker found himself restricted to his little 10-acre ranch. Of course there was nothing in it for him if he desired to raise grain, so he began to look into other kinds of farming. Finally he made a venture in poultry. This was nine years ago, and with the exception of the first year from the 10 acres his net receipts have equaled each year those of the 100 acres in grain. Last season his 2,900 chickens

returned a gross revenue of \$10,000 and a net profit of \$6,000. This year he is handling 5,000 chickens on his 10 acres, and is confident that his profits will exceed those of 1920 by 100 per cent. Mr. Bowker's favorite is the White Leghorn.

The first link of a concrete highway system in Maricopa County, which is to be 278 miles long, was completed and fittingly celebrated on August 28. This initial concrete highway links Phoenix and Chandler. The contractor's forces are pushing the work of construction, the first part of which is to tie in all the towns with the State capital.

California, Orland project.—The almond crop never was so heavy in the Orland section as it is the present year. The preliminary estimate made by County Horticulturist H. M. Kingwill of a 120 per cent crop has been fully justified by the harvest. Both old and young orchards are yielding heavily, and the nuts are of prime quality. The crop the present year will be not far from twice the yield for any previous year.

The outlook for a profitable market is regarded by the market men as good. Small early offerings are commanding good prices. The surplus, which owing to the financial depression all over the country hung on over a period of two years, is now disposed of, and the new crop will enter a practically empty market, and with improved conditions that will enable the growers to secure a fair price for their entire product.

On the Orland project turkeys are raised in large numbers and are grazed very much like sheep. Flocks of turkeys are driven out to pasture in the alfalfa fields and in the evening are rounded up and brought to the farmyard. They have proven of great value in eradicating bugs and rendered vallant service during the period when swarms of grasshoppers descended upon the Valley.

Over in Solano County the grasshoppers became a plague and destroyed many acres of valuable crops. The farmers issued a call for help from the Orlanders, who responded by renting several thousand turkeys which were turned upon the advancing hosts of hoppers. Many infested fields were cleaned up, and the turkeys showed a fair increase in weight from the abundant feed supplied. It is reported that many of the fowls suffered with indigestion due to lack of proper exercise. The hoppers were so numerous that

the turkeys had only to squat in their tracks to fill themselves to repletion.

Colorado, Uncompahgre project.—Felix Maranowski, the very successful farmer near Olathe, harvested 9 carloads of early potatoes from 20 acres, which sold for \$6,000.

T. C. Anderson secured \$2,000 from 5 acres of early potatoes. Four hundred dollars an acre for spuds is considered very good.

As a method of putting a little spare cash in their jeans a number of Montrose and Delta farmers planted a few acres of string beans for the Delta canning factory. One chap plunged rather heavily into the game with 10 acres and cropped about 30 tons, for which he was paid \$50 per ton. W. L. Loberts, of Montrose, sold \$100 worth from half an acre.

The bean crop matures early and is harvested before the heavy demand for labor comes. Apparently it is a profitable crop, too. The Delta factory canned seventeen thousand 2-pound cans in a single day.

Idaho, Boise project.—With potatoes soaring above the \$2 mark Boise Valley growers are viewing the future with complacency, and are rushing their spuds to market at a lively rate. Shipments of 75 cars in a single day were rolled out of Nampa, and Caldwell came into the limelight with 25 carloads.

Boise Valley spuds are early and the biggest part of the crop is off in September.

Idaho, Minidoka project.—A saving of at least \$1,500 was made one potato grower in the county as a result of potato inspection work done by the extension department in company with the county agent. The farmer in question is stated to have had 10 acres of exceptionally fine spuds which he was holding for \$2 per hundred, although being offered only \$1.50.

Mr. Bennett informed the man he could get him a buyer within 24 hours who would give not less than \$3 a hundred. The field will yield not less than 1,500 sacks of first-class seed, it is stated, and the grower's profits will be augmented considerably by the advanced price he will obtain.

Enough fields were located during the trip to insure plenty of good seed stock for local use for another season, and farmers are urged to buy only the best and to know the field from which it comes before buying.

Nebraska-Wyoming, North Platte project.—In order to promote the planting of better grades and to show the benefits of intelligent cultivation, organizations on several projects arrange for a tour of the fields each fall and there study at close view the demonstration plats and the fields of the farmers who have had pronounced success.

The North Platte Valley folks are large growers of potatoes and are evincing a very commendable inter-

est in the educational movement which is spreading over the valley to standardize this crop and to insure production of the best grades. The purpose of the annual tour is set forth below:

1. To enable the growers to inspect a number of fields of potatoes being grown under irrigation in the North Platte Valley from western Nebraska dry-land certified seed potatoes as well as from home-grown irrigated seed and seed imported from other States.

2. To inspect the various demonstration plots in which seed from various growers in the different localities are being grown comparatively.

3. To study the various variety trials and experiments with seed potatoes that are being conducted by the Nebraska Agricultural Experiment Station.

4. To inspect the irrigated potato rotation plots at the Scotts Bluff County Experiment Farm. (This is probably the best set of rotations with potatoes that can be found anywhere in the United States.)

5. It will enable the irrigated potato growers to see what an important factor good seed potatoes are in growing seed potatoes, to study the relative merits of dry-land seed potatoes, and to see at first hand the good fields of seed potatoes and the men who are growing them.

6. In addition, with the authorities on potato culture and potato diseases present it will be possible for any one attending the tour to secure a large amount of information concerning potato production.

Nevada, Newlands project.—O. J. Vannoy, to whom belongs the credit of making the Lahontan Valley famous as a cantaloupe producer, stated that he has orders for 50 crates a day.

The packing and shipping is an important part of the work and the culling and selection of the best for crating makes a wonderful difference in the market value. Mr. Vannoy puts the melons up in various sized crates to accommodate the trade.

Judging from the demand that Mr. Vannoy has found, it will be easy to dispose of all the cantaloupes that can be produced in this valley if proper attention is given to selecting and packing. Therefore, if the industry is fostered as it should be the time will soon come when Fallon cantaloupes will be shipped out by the carload.

The dreams of the ardent supporters of a local flour-mill enterprise as a part of community betterment will soon be realized, according to D. McCall, proprietor of the Fallon Flour Mill. He states that he has completed a deal for 50 tons of hard wheat from R. I. Douglass and a like amount from the Wingfield ranches in the Island District. This is a fine grade of hard wheat.

Mr. McCall states that the flour will be sold through the local stores. It is expected that all of the local stores will handle this product so that people can be supplied with Lahontan Valley flour and thus help the farmers to turn their wheat into ready money.

✓ *New Mexico-Texas, Rio Grande project.*—Twenty-two thousand dollars in taxes was saved to producing farmers in Dona Ana County August 23 when the State tax commissioners of New Mexico decided upon a reduction of 20 per cent, or \$816,000, on the as-

sessable valuation of cultivated farm land. This means a saving of from \$12 to \$13 to every farmer in the county.

The reduction came as the direct result of a series of conferences with farmers and a public hearing, conducted by H. H. Brook, president of the Elephant Butte Irrigation District and trustee of the Dona Ana County Farm Bureau. Mr. Brook was assisted by S. S. Hookland, general manager of the Farm Bureau Marketing Association; Dr. R. F. Hare, agricultural statistician in New Mexico for the Bureau of Markets and Crop Estimates of the United States Department of Agriculture; Col. M. C. O'Hara, Fred S. Hess, Francis E. Lester, W. T. Scoggin, Capt. Thomas Franklin, and W. P. Thorpe, members of the Farm Bureau.

Mr. Brook showed by official records that Dona Ana County is more fully and completely assessed than any other county in New Mexico. He showed that of 100,117 acres of land assessed at an average value of \$55.10 only 55,265 acres are under cultivation.

In the course of his argument for a substantial reduction in taxes, Mr. Brook said the farmers in Dona Ana County—optimistic, progressive, efficient men and women—are doing everything they can in the way of organizing and cooperating to help each other; that the farmer is the backbone of town and country and therefore is deserving of the utmost consideration, and that nothing should be done to hamper the farmer, for if the agricultural interest suffers every line of business and activity in Dona Ana County suffers.

J. E. Saint, chairman of the commission, and his colleagues, J. R. Aguilar and George L. Ulrick, visited various parts of the county after the meeting, and at a conference that followed they granted a horizontal reduction of 20 per cent.

Speaking for the commission at the close of the conference, Mr. Saint said to a correspondent of the RECLAMATION RECORD:

Dona Ana County has a wonderful future. It has fertile soil, an ample supply of water for irrigation purposes, and an abundance of sunshine. The Elephant Butte Dam, a monument to irrigation engineering, will stand forever and, with the completion of the drainage system now under construction, will make this one of the most productive valleys in the Southwest.

Of course, it takes courage and sustained optimism to overcome obstacles, and it means lots of work to develop the land; but we believe the farmers in Dona Ana County and those who come into the district in the future will work out these problems in a satisfactory way.

Commenting upon the tax reduction, the Las Cruces Citizen says:

Too much credit can not be given to Mr. Brook for his admirably organized work in bringing this reduction at a time when it is needed by the real farmers. The Citizen takes especial pride in saying again that H. H. Brook is doing a big constructive work in this county, district, and State and that he is a valued resident of the community.

The Elephant Butte Irrigation District and the Dona Ana County Farm Bureau are to be congratulated upon having a man of his diversified business training and exceptional talent and capacity to keep a watchful eye on their affairs. Mr. Brook has our best wishes for continued success in his line of endeavor.

Irrigation farmers in Dona Ana County, N. Mex., lead in having as their official home the first Temple of Agriculture in the world. It houses the officers of the Elephant Butte Irrigation District of the Rio Grande project, several departments of the United States Reclamation Service, and the Farm Bureau and its cooperative and marketing associations. Ten thousand dollars, the cost of the building, will be absorbed in 10 years on a saving of \$1,000 annually. Thus the members of the Farm Bureau and irrigation district will not be called upon to pay a single dollar for the property.



Inset: H. H. Brook, president Elephant Butte Irrigation District.

The front part of the first floor of the Temple is devoted to business offices, occupied by "Governor" H. J. Evans, secretary; Nathan I. Reiter, chief accountant; and Miss Rose Johnson, stenographer, of the irrigation district; and by W. J. Ball, superintendent of irrigation; M. B. Moore, special fiscal agent; Lew's Davis, time and cost keeper; Miss Agnes Lallance and Clyde Baker, water recorders; and W. H. Shillito, hydrographer. Back of these are the offices

of H. H. Brook, president, and August Wolf, service director, of the irrigation district; S. S. Hookland, general manager of the Farm Bureau Marketing Association; Robert C. Stockdale, county agricultural agent; Ira T. Collins, plant quarantine inspector; and Mrs. Sarah Van Vleck, home demonstration agent, and clerks and stenographers. In addition there is a large conference and smoking room; also a well-furnished rest room for women. The second floor contains a large meeting hall and dressing rooms and two office rooms.

The Temple is provided with the latest approved electric-lighting system and local and outside telephone lines connecting with practically every farm in the county. The offices and halls are adequately furnished. The first floor is of blocked concrete. The walls are tinted. The heating plant is in a separate building in the rear of the structure.

Though the Temple has been occupied since August 1, the formal opening will not take place until early in November, when Secretary of Agriculture Wallace; A. P. Davis, Director of the United States Reclamation Service; Gov. Mecham, and other prominent men of New Mexico and neighboring States, have been invited to join the farmers of Dona Ana County and visiting members of farm bureaus throughout the Southwest at the celebration.

The fullest credit is due to Mr. Brook for his work in negotiating the deal by which the Farm Bureau and irrigation district acquired the property, and for planning the remodeling of the building and arranging the interior divisions. Every foot of space has been utilized to advantage.

"The building," Mr. Brook said in conversation with a correspondent for the RECLAMATION RECORD, "is adequate for all the purposes contemplated in the next 10 years, and in addition to a saving of \$1,000 annually in rentals, it also affords facilities for greatly increasing the efficiency in all departments of the three organizations."

Hog sense is responsible for the discovery of a new swine forage crop in the Mesilla Valley, N. Mex. On the Freudenthal ranch, near Las Cruces, where swine raising is an important feature, a number of hogs broke out of the feed lot and later were discovered in a low tract of ground rooting among the cattails and apparently enjoying the tender roots.

Mr. Freudenthal, as an experiment, put up a portable fence around the tule patch and kept the hogs there for three months in order to ascertain the food value of this root crop.

The results were eminently satisfactory, the hogs showing a good gain in weight and retaining perfect health, the increase in weight being fully equal to that shown by hogs fed on alfalfa and grain. The pigs were later finished with grain before marketing.

The tule abounds all over the irrigated country, growing rank in the low, wet places and along the drainage ditches. In many parts of the West are

found broad tule marshes of shallow water which have heretofore been regarded as worthless. In the event that fuller investigation and experiment demonstrate the food value of the root of the tule for hogs, these areas may take on considerable value as cheap pasture.

Washington, Okanogan project.—Out of 344 milk cows in the Okanogan Valley tested for tuberculosis, only 1 showed signs of being diseased.

Over 1,500 cows in the county were tested and of this number only 14 were found to be affected with the disease.

These are records that the dairymen of this county may justly be very proud.

Eastern Washington's apple crop is 45 per cent of the entire crop of the United States and will bring nearly \$50,000,000. Nine-tenths of this will come to the Wenatchee and Yakima districts, with Wenatchee leading.

Washington, Yakima project.—Grandview is proud of the new and strictly modern storage plant which was completed recently and is now ready for service.

The plant will handle about 200 cars and will enable the grower to have his packing done and plenty of storage to care for it until he wants to send it to market.

It is pointed out that cold-storage space has always been at a premium in the valley and that growers ought not to delay simply because Grandview now has a plant of its own. The man who has all his arrangements made for the handling and storing of his crop may have a good laugh later in the season when everything is crowded.

This plant means much to the growers of the Grandview district and so far they have shown a very lively interest in its construction.

Yakima's hop crop this year will amount to 28,000 bales and will be valued at about \$1,112,000, according to an estimate made by Richard Strobach. Of the money received for the hops at least \$350,000 will go for wages, Strobach believes.

Although hops have sold as high as 31 cents a pound this season, hops are now selling on the spot market at 20 cents a pound and at 25 cents on contract. Although not the lowest, it is far from being the highest price received for hops in this district.

Grapes, which have hardly been considered one of Grandview's large crops, will probably come under the wire this year with from 30 to 40 cars.

This will mean a very tidy sum to the growers and the district as a whole, as grape prices are keeping pace with fruit prices this year. While prices vary with varieties, there have been many contracts at from 30 to 35 cents per basket.

For a number of years now grapes have proven an excellent crop. Much land here is adapted to grape growing and it is probable that the acreage will be increased still more another year.—C. J. B.



OCTOBER SUGGESTIONS FOR POULTRY FARMERS.

By H. O. Numbers, Poultry Expert, Loretto, Pa.

DURING the month of October the poultryman finds himself busy from daylight until dark. The one important problem is housing or finding proper quarters for his birds. All pullets should be taken from the range before frost arrives. Have your houses comfortable, well ventilated, and cheerful. Get the pullets acquainted and accustomed to their new environment. Treat them carefully, study their nature, teach them to know and recognize you. In other words, tame them so they have no fear when you approach. Our pullets are all in their winter quarters by now, as our season is about one month in advance of other sections.

Feed plenty of greens. You have cabbage, celery tops, beets, etc., from your garden. Don't waste any; feed as much as they will eat. Avoid potatoes in any form. We feed our greens in racks to avoid soiling the litter. A simple "greens feeder" which we use is constructed as follows: Take a 2-inch plank, 12 inches square, for the base; make a square frame from 1 by 2 inch lumber the size of your base. Tack strips of lath 2 feet long and 2 inches apart around the base and frame (which is the top). The top will be open. The reason for the heavy base is to prevent upsetting. The contraption is merely a box open at one end, and having 2-inch cracks around the sides to permit the fowls eating the greens. Such a feeder will take care of 40 hens. We have tried numerous devices, but find this one the best, as it is the nature of a chicken to do what it should not; hence, the fowl thinks it is stealing when it pecks through the sides of the feeder and secures the greens.

If you have any cull pullets or cockerels, market them this month. Do not hold them over. If you are in doubt as to any, class them as culls. Remember that a doubtful bird is usually a cull.

Your cockerels which you intend carrying over for breeders should have comfortable quarters and some range. Keep them by themselves. If a coward develops in your pen kill him off; he won't make a good breeder. We are keeping twice the amount we will require. Later, we will enlarge on this subject.

Again we want to remind you that the male bird represents 50 per cent of your flock, so give him as good care and attention as you do your pullets.

Our yearling hens which we are holding over for next year's breeders are now starting a much-needed vacation and rest. They are still laying, but are dropping off slightly. We have moved them from the regular laying pens to large colony houses 20 feet square, where they will remain until after the incubation period next season. Our colony houses serve a dual purpose, and work for us the year round. As soon as the youngsters come off the range, we thoroughly renovate and put in condition for our breeding stock. Our yearlings are happy in their new home. We take especially good care as to their diet, so as not to accelerate or retard the molt. Next season our breeders will be in the pink of condition for mating, our fertility will run high, and the vitality of the chicks will be of the highest standard, because our breeders have had proper care.

Our present feeding schedule for our yearlings is as follows: Fresh water always. Mash hoppers open all day with the following combination: 100 pounds of bran, 100 pounds of corn chop, 100 pounds of oats chop, 50 pounds of oil meal, 1 per cent salt. No beef scrap, as we feed green cut bone. In the absence of bone we feed 20 per cent beef scrap to the above formula. In the morning we feed semisolid butter-milk in earthen bowls, 3 pounds to 75 birds. This is readily cleaned up. We feed scratch feed once a day, in the afternoon, equal parts of wheat and cracked corn, and all the greens they will eat. Grit and oyster shell are cast in the litter. Every two weeks we mix 5 per cent powdered charcoal in a day's feeding of dry mash. Too much charcoal constantly in the mash results in the birds losing their appetite for the mash. At least, this has been our experience.

We feed no tonics, only good clean wholesome food, with proper attention.

Do not wait until cold weather is here to make your birds comfortable. Do it now.

Dried Apple Pomace Succulent Feed for Dairy Cow.

Dried or "evaporated" apple pomace as a succulent feed for the dairy cow is the subject of a preliminary report from the Bureaus of Chemistry and Animal Industry of the United States Department of Agriculture based on an experiment to determine the feeding value of dried apple pomace, especially its suitability as food for cows in lactation.

It appears that there is a belief among dairymen that the dried product has a tendency to cut down the milk flow, or even cause cows to go dry, although apple pomace fresh from the cider press is generally recognized as being a good succulent feed for milk cows. To test the soundness of this belief, a feeding trial has been carried out by the department. Only one cow was used in this test, and the total quantity of dried pomace fed was less than 400 pounds; therefore, it must be borne in mind that the results obtained, while indicative, can not be accepted as conclusive.

In this feeding trial the dried apple pomace was fed wet and its feeding value compared with that of corn silage, since it is intended to be a succulent feed. The pomace was prepared by adding to the dry material three times its weight of water several hours before feeding, thus producing a feed similar in water content to that of corn silage.

For a period of 30 days the cow received a balanced ration consisting of grain, hay, and corn silage. The silage was then replaced by the apple pomace for a similar length of time, allowing a 10-day transition period for the change in diet, and after a like transition period at the end of 30 days the original ration containing silage was resumed and continued for a third 30-day period.

The quantity fed—36 pounds of wet pomace per day—was such that the total dry matter in the pomace equaled the weight of dry matter in the silage replaced. The quantities of grain and hay fed remained practically constant throughout the whole experiment.

Although the data obtained are not sufficient to warrant the drawing of final and definite conclusions, the indications are that no bad effects follow the feeding of dried apple pomace. There was no decrease in the milk flow nor in the yield of butter fat.

When fed as described the dried pomace appeared to be equal, pound for pound of dry matter, to good corn silage as a succulent food for this dairy cow. Owing to the property which it possesses of absorbing large quantities of water and swelling, it should never be fed dry, but should be allowed to soak in water for an hour or so before feeding. The pomace appears to be a palatable feeding stuff.

Caution is advised in feeding dried apple pomace, as there is a possibility that the feeding of large

quantities, or of quantities containing excessive amounts of apple seeds, might prove injurious. It appears to be safe, however, to feed as much soaked pomace by weight (1 part dried pomace to 3 parts water) as it would be to feed the same amount of pomace fresh from the cider press.

New Light on Development of Tubers in the Potato.

How do potatoes grow?

Why do some vines produce many tubers and others only a few?

Do big seed pieces produce better potatoes than small pieces?

When does the tuber begin to form?

When does moisture have the most effect on the production of potatoes?

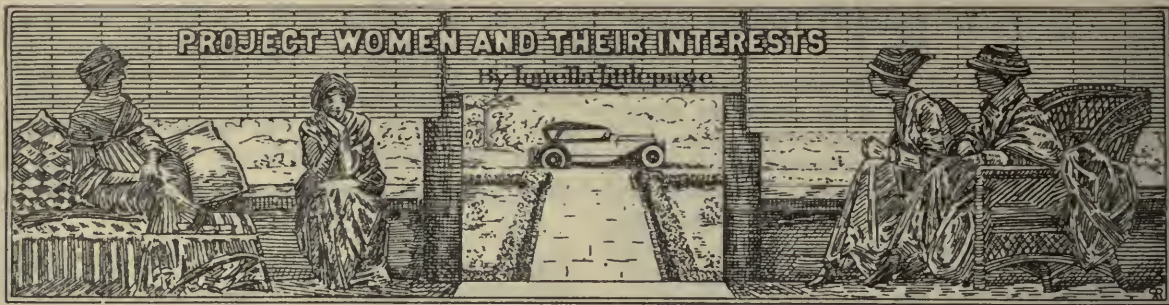
What is the relation of soil to potato production?

Tuber formation begins in general at about the end of the period of flower bud development, although this is not in all cases an exact criterion. Experiments by the Bureau of Plant Industry showed that the number, as well as the size, of potatoes in a hill increased for several weeks after the first potatoes were large enough to dig. A small increase in the weight of tubers was found to occur even after the vines had been killed by frost. The maximum rate of growth of the tubers was found to occur about the last of August or first of September, which was approximately 80 days after planting.

The number and weight of tubers per hill are influenced by the size and the kind of seed planted. Whole potatoes used as seed yield heavier than half potatoes, and these more than quarters, and the larger the seed piece the greater the yield per hill. A whole potato used as seed yields more than a half or quarter potato of equal weight.

Apparently light soils are better for potatoes than heavy soils. The lowest production of tubers, with respect to both number and weight per hill, was on the heaviest soil; the highest numbers and yields were produced on the lightest soil. These results may, however, be modified somewhat under different climatic conditions.

Two-year tests with irrigation indicate that the early application of water before tuber formation had started resulted in an increase in the number of tubers, as well as in the weight per hill. Late irrigation actually increased the weight but made little difference in the number of tubers per hill. The irrigation experiments were not carried to a final conclusion, but indicate that each application of water at almost any period in the growth of the plant, *provided excessive quantities are not used*, may be expected to produce an increase in the weight of the crop, but that little or no increase in the number of tubers is likely to result from irrigation after tuber formation is well started.



THE SWIMMING POOL FAD.

HOW the world "do move." Within the memory of all of us the country kid who wanted to swim had to sneak away to the creek or pond and invent an endless variety of reasons why his hair was so frequently wet and his shoulders sunburned. "The old swimming hole" is not an invention of a poet's brain, but a reality whose cool depths and mossy banks are among the tenderest memories of multitudes of country-bred citizens.

Who shall say just how great a part these memories played in bringing about the movement which is now sweeping the West?

In July the Glendive (Lower Yellowstone project, Montana) papers challenged our admiration for the way the citizens of that town grasped a suggestion of a sweltering business man for installing a swimming pool and carried the project to completion within a month.

To-day the project papers are filled with enthusiastic accounts of swimming pools completed, swimming pools in the making, and swimming pools proposed. Sunnyside, Wash., was just "pouring the sides" when the Sun went to press, and expected to dedicate the structure by September 1. Montrose, Colo., was planning a swimming pool and outdoor pavilion at the fair grounds. Convict labor had been arranged for and the public was assured that the improvement was bound to go through with a bang as the county was behind it. Like other up-to-date project towns, once they got started, they never stopped with a pool. Hundreds of trees are to be planted and thousands of square yards of grass sown. Shower baths and bathhouses will be constructed for tourists. Hundreds of citizens of Montrose have been driving 28 miles to Ridgeway for a plunge, and hundreds more would go if they had cars. The boys steal down to the muddy river when they want a cooling dip, just as their fathers did before them, because of the obdurate parents who can not consent to the dangerous pastime. The commissioners are considering the boring of an artesian well to furnish water for the pool as they believe they can get a plentiful supply at 900 feet. And then there will be a dancing pavilion, which can be used for many

other purposes as well. They have moved the fence and cleared the ground and residents for miles around are full of anticipation of next summer's joys.

Grand Junction, also on the famous western slope, doesn't propose to be outdone by any other Colorado town, and why should it when two public-spirited citizens, Mr. and Mrs. William J. Moyer, offered a pool as a gift to the city? It didn't take that town long to decide on a site, and the Sentinel of August 31 carried the joyous news that as soon as the plans for the 50 by 125 foot pool were completed the actual work of construction would be begun. It will be located in the middle of a plot of several acres in Lincoln Park, and there will be dressing rooms, an office building, and other necessary buildings, with the park surrounding carefully and artistically developed.

Over in Fallon, Newlands project, Nevada, the proposition to establish a municipal swimming pool in the city park, which had been under consideration for some time, took on definite shape one hot August day, when the project manager consented to let one of the big excavators of the Reclamation Service be swung into the park and tested out in excavating for the swimming pool. A committee of boys solicited funds to operate the dredge, and an excavation 60 by 115 feet was soon completed. Then the chamber of commerce took the matter up and nearly all of the business houses in town agreed to donate 5 per cent of their sales on August 20 to the swimming-pool fund.

Can't you imagine what a day it was? Everyone wants the children to have a safe, sanitary place where they can learn to swim. Can't you see the money in the private coffers in Fallon and vicinity changing into supplies for the winter on that day? Groceries, and dry goods, and hardware, and drugs, motor supplies, and furniture, paint, and shoes, books, and pictures, and everything under the sun was bought generously. The men got shaved and trimmed, the frivolous played billiards and pool, and the hungry gorged on ice cream and sundaes; in fact, the whole town went on an orgy of buying in the hope that the anticipations of the kiddies might be realized

and that the municipal swimming pool would be assured at an early date.

El Paso, Tex., on the Rio Grande project, has three swimming pools and expresses satisfaction at the seriousness with which both men and women are making successful efforts to rank with expert swimmers of the coast towns. They enthuse on the charm of the Washington Park pool, where early risers are wont to take an invigorating swim in the morning hours, on the Sunset Heights pool with its comfortable platform for "grand-stand players" and the classy diving of expert citizens.

And so the papers go on and on. They're all building them. There is no need for any long discourse as to the ethical and economic advantages of a swimming pool; no need to dwell on the physical advantage and democratic freedom to be gained through the establishment of these resorts; no need to mention the bond which will be established between city and country people who are brought together in this delightful and intimate manner.

One amusing feature of the movement is the show of outraged masculine dignity when it becomes understood that these pools are for the unrestricted use of girls as well as boys, and the masculine condescension at the news that a wading pond will be built in almost every case for the tiny folks.

There is general rejoicing, too, over the sensible one-piece bathing suit. It was a dangerous practice and the height of false modesty which formerly swathed women in tailored suits when they went in the water. No wonder so few of them learned to swim. There will be less need in future to hie to stuffy cottages or expensive hotels during the hot summer days when all can have all the pleasures of a summer resort right at home, and can stay in one's own comfortable home to enjoy them.

Speaking of swimming pools, we call to mind a visit to a delightful new ranch home on the Minidoka project some 10 years ago, where a section of the irrigation canal in the back yard had been enlarged and cemented for the family recreation. A border of quick-growing willows furnished seclusion and shade, and altogether it was a delightful spot which any water user could duplicate at little expense and labor.

The Tourist Camp.

In most sections of the country the tourist season is over, but in making up club programs for the coming year women will do well to consider just what the tourist means to the community and what they can do to increase the travel in their direction.

Don't forget that all tourist business is cash. The tourist asks no more value for his dollar than any other purchaser, but he wants as much, and when he is rightly treated is the best advertiser you ever heard of. A modest tourist camp, rightly managed

and advertised, will stop many good dollars right at your door, and carry more good words for your community than most any other agency for the same outlay.

It takes but a trifling outlay to make some available spot inviting and convenient for the travelers. Auto tourists usually belong to a desirable class. They are a happy bunch out for recreation, with their cares locked up behind them. They need auto supplies and food. They buy fruit and confections, fresh vegetables and chickens, and they spend money for souvenirs that are typical of the section and not too expensive.

A recent newspaper printed in Spokane stated that the local chamber of commerce estimated that tourists who camped in their park during the present season had left fully \$6,000 in their city, and they are urging the city to appropriate \$10,000 for the improvement of the tourist camp for the coming year.

Electric lights, screened-in kitchen, dishes, tables, chairs, and toilet facilities make an ideal camp. Some simple arrangements like this and a welcoming smile from every resident they meet will do wonders for your community.

I know a traveler who was once fortunate enough to arrive in Seattle during Potlatch Week. Most westerners know what that means. Like any gala day in a western town there were laughing, verbal greetings from everyone he met, "Welcome" shining not only on the mat but blazing from myriad electric signs, waving from every window, gleaming in every eye. No one can convince that traveler that anywhere in the West is there such another city as Seattle. He boosts it on every occasion and in every place, and frequently makes the statement that should he ever consider moving from his home town he hopes to go to Seattle to spend the remainder of his life.

To the traveler, weary at the close of day, it is like sailing into a haven of rest to draw up to a well-kept camp. It warms his heart toward the whole world in general and to that particular community in particular.

Automobile touring is increasing mightily. Don't overlook your opportunities in this direction now that the business is young and the looking good.

Do They Teach Agriculture in Your School?

Has it ever occurred to you that there is something lacking in the school course which has nothing to do with the growing of crops, when the people of the community are an agricultural class and the problem of tilling the soil and producing live stock are their chief concern? The State agricultural college is so remote from the majority of farm boys and girls that they only receive hints of its teachings in their club work.

Farming is now recognized as a real science. To make high-priced land really pay these days requires

expert skill. Enlightened farmers to-day are not content with a mere existence on a trifling income. Either they must receive an income commensurate with their ability or they will cease to be producers and turn to some other occupation.

Most mothers would prefer their boys and girls to remain on the farm if the life can be made something more than serfdom. To make three or four hundred dollars on a 40-acre farm is not difficult, but to make three or four thousand dollars' profit in a year from such a farm is the work of an expert. That is what the present generation of farmer boys aspire to become, and it is what they must become if the farm is to offer them any inducement.

SHOSHONE PROJECT TO HAVE AGRICULTURAL COURSE.

A late Powell paper announces that the subject of agriculture is henceforth to be taught in the Powell High School as one of its most particular and conspicuous courses of study.

An expert from the State agricultural school at Laramie has been secured as instructor. He will carry on the course of study under the Federal law which provides for financial assistance to high schools for this purpose.

The course of study is not confined to the 9 months of the school year, but is a 4-year course running throughout the 12 months of the year. It is in no way connected with the boys' and girls' club work and will not interfere with it.

HIGH-SCHOOL COURSE IN AGRICULTURE ON NEWLANDS PROJECT.

The Newlands project people are to be congratulated on the new course which has added agriculture to the list of studies in all the high schools in Churchill County. Farmers have been asking for a number of years for a good strong course taking up the essentials of farm work and preparing the boys to regard intelligently everyday problems of farm life.

A good many movements have been set on foot by organizations interested in the development of the various projects to bring in new settlers who would go on with the cultivation and bringing in of the raw land of the sections, and it can be readily seen how much more advantageous it is to a project as a whole to develop the farmer from the growing boy who is familiar with every phase of farm life on the project itself.

One of the most advantageous features of the work is that practice goes hand in hand with theory. But one course will be given this year, agronomy. Studies of soil, as far as texture, classes, and rough field analyses will be the order of things. A course in general crops will be given later, and work will be taken up in the development of certified seed of various kinds. The work will be made as remunerative as possible to give the boys a keener interest. The school

work will be carried on in conjunction with the general scheme on the boys' home ranches.

The Yakima, Wash., schools will again furnish milk for pupils, and have just let a contract to the Jersey Home Dairy for supplies. Milk will be sold to all the pupils, including those of the high school, and will be given without charge to those who can not afford to buy it. Half pints will be supplied for 2.45 cents and pints for 4.75 cents.

The experiment of seeing that each pupil was supplied with milk last year was most satisfactory in raising efficiency and health standards, and it would be well to extend the practice to every school in town and country. Anyway, it is worth trying.

The Deaver Woman's Club, Shoshone project, Wyoming, held a meeting recently which marked the close of the club year's work, when reports were made and suggestions offered for the coming year.

This club has been instrumental in forwarding the proposition of getting the local cemetery fenced; they have raised money to equip the Deaver school with many of the tools needed for manual training; they carried on refugee work for the Red Cross, etc. A successful poppy sale was sponsored by the club, the proceeds of which were sent to the orphans of France.

Motorizing Its Schools.

The Olathe (Uncompahgre project) schools are to be motorized this year. That is, there will be at least four and possibly five motor trucks used to bring school children to Olathe schools. Last year one was used as an experiment, and it was such a success that more are to be added this year, and but one horse-drawn vehicle will be employed. These trucks bring the pupils from the surrounding country, one going down the river to the Delta line, three on East Mesa, and possibly another on High Mesa. The people there want their children to attend the Olathe schools although they belong to Coal Creek, and if it can be arranged so this section can be added to the Olathe district, the latter will put on a truck for their accommodation.

Shade Trees for the Civic Center.

The Woman's Improvement Club of Orland, Calif., is cooperating with the Chamber of Commerce in working out a scheme of tree planting that will make the Civic Center available as a place of rest and shade for the present generation. It is hoped to fill the entire park with quick-growing trees of the commoner varieties. The plans of the park will be adhered to and none of the present growth will be disturbed. It may be necessary in 10 or 15 years to

cut out a number of these new trees to allow room for the slower-growing trees.

Montana Cares for Children at Fair.

At the Montana State Fair this year arrangements have been made that will interest a large number of people who desire to motor to the fair from various points in the State. A children's playground has been established at the tourist camp on the grounds where parents may leave the youngsters safe in the care of an instructor while they take in the exhibits at their leisure. The playground is inclosed, and both shade and amusements will be furnished to keep the children interested and happy. Heretofore the problem of taking care of the little chaps at a place like the State Fair and at the same time enjoy and profit by the fair in a way to justify the trip kept many women and some whole families at home. The happy solution which automatically and effectively takes good care of the youngsters is a decided advance over the old system.

Give the Children Milk.

Many a farmer who understands the importance of bone building in young farm animals forgets entirely that his children are subject to the same requirements. Every farmer knows that his calves are inferior if they do not receive sufficient milk. The same applies to children.

The extreme importance of milk in the diet of children lies in the fact that milk is one of our richest calcium-giving foods, and calcium is an essential bone-building mineral nutrient. The calcium requirement of the child exceeds that of the adult. Meat is very low in calcium; fruit and vegetables contain small amounts, a few of the green vegetables quite a large amount. But the main source of calcium is the milk. A quart of milk a day for each growing child is a desirable allowance.

Breeding of Game Birds.

In response to an inquiry anent the propagation of game birds, Mr. Dwight W. Huntington, president of the Game Conservation Society and editor of *The Game Breeder*, informs us that several hundred women in this country are now profitably raising game birds, and that many women in foreign countries are thus engaged. Mr. Huntington, 110 West Thirty-fourth Street, New York City, offers to send copies of *The Game Breeder* to women on our projects, and will be glad to put them in touch with other women who are successfully breeding the species of game which interests them.

The Game Conservation Society has been experimenting with game birds during the past year, and has simplified the methods so as to reduce the cost materially. For instance, they have raised pheasants

for the exceptional cost of 40 cents each, and these birds now sell readily for \$3.25 each. A woman who writes for *The Game Breeder* states that she has specialized in wild turkeys; that they are easier to raise and cost less than tame birds as they do not suffer from diseases which often appear in flocks of tame turkeys. She sells her birds for breeding purposes for \$25, and finds a ready market for her eggs at \$12 per dozen. In this connection the following extracts from an article in *The Game Breeder* by G. F. Johnson, on the Wild Turkey, will be of interest:

For the benefit of those who are not familiar with the wild turkey I will try and describe these birds, our method of raising, breeding, and handling.

There appear to be several distinct varieties of these birds, although they are all somewhat alike. Their color is a deep, copper bronze, much more brilliant than the domestic. The upper tail coverts are brown where the domestic bronze is white, wing coverts bronze tinged with gold and green tipped with black. The barring on the flight feathers is perfect.

In a wild state these birds are smaller than the domestic, but when bred in a semiwild state they become large and lose all fear of human beings.

The natural home of the wild turkey is a wooded, mountainous country. They never migrate or fly like the wild duck or goose. The only time they fly is when suddenly frightened, when they will fly for a short distance and then run and hide. When raised with chickens or domestic turkeys they become as tame as their foster mother. This is true of any wild birds raised in captivity. We never clip their wings because this puts them at a disadvantage in protecting themselves from enemies.

You have probably noticed that the domestic gobbler gets very heavy, lazy, and can scarcely fly at all when over 1 year old, and makes a poor breeder. The fertility in eggs from hens mated to him is poor. The wild gobbler is just as active and as good a breeder when 9 years old as at 1 year. We used a 9-year-old wild gobbler and mated him to 20 hens. The eggs hatched 97 per cent—very strong, healthy poults.

If you are breeding for size, mate a wild gobbler to large bronze domestic hen turkeys. The offspring from this cross will be large and healthier than the domestic, and at the same time you have improved the bronze color and will notice an astonishing ability to rustle their living and be as tame as the domestic turkey. We have seen half and three-quarter wild turkeys that weighed between 40 and 45 pounds.

We keep our birds in a 3-acre inclosure fenced with 4-foot fence divided into two pens, in order to protect the setting hens and get all their eggs. The first eggs are laid in April; after laying 16 or 17 eggs they become broody. They are then broken up, their nest destroyed, and the hens placed in yard No. 2, where they again mate and start to lay in a few days. This second setting of eggs we let the hen hatch, which will be about the middle or last week in June, when the weather is warm, more settled, and not so much rain. By this time insect life is abundant, which is 95 per cent of their food. If we allowed these hens to set and hatch the first setting they would hatch in May, which is cool and rainy in the northern states, and a large number of chicks would be lost. Besides the first eggs can be

sold at \$1 each. By this method we raise 50 per cent more turkeys with no care nor worry.

For nest boxes we use a box with a hole sawed in one end, placed on the ground. Shape out a hollow in the ground, place in it straw or hay and two nest eggs. On top of the box place long weeds or brush so that it hangs over the opening. This makes a very attractive place for the hen to hide her nest.

A few days before the hen is due to hatch, place a 6-inch board in front of the opening, leaving enough room so the hen can get out easily. The idea is to keep any young turkey in the nest that hatches before the rest. Just as soon as a turkey is dry it runs out of the box; the hen will follow and leave the rest of the eggs that are just hatching. By keeping the young turks in the box the hen will stay until all the eggs are hatched, when you can gently remove the board and let the hen have free range.

The wild turkey hen makes the best mother if given her own way to raise her young. If cooped up she will trample and kill all the turks in her efforts to escape. We consider a young wild turkey safe as far as cold rain is concerned after he is 2 weeks old. We never feed or bother the hens after they hatch until late fall, when we start to feed at a certain place where we want them to roost. Never

disturb or go near a wild turkey at night. If you do they will not roost the same place again.

A very good place for wild turkeys to range is a pasture where the grass is short and there are patches of weeds for them to hide in. Long heavy grass holds too much dew, causing the young turkeys to get too wet. Turks want warm, dry weather. Near the place they range plant some corn broadcast. The standing corn offers shade and the cultivated ground is a good place for them to dust themselves, which is very important.

Do not keep the turkeys in a close, warm building; to do so generally kills them. A shed open to the south, or a windbreak made by boarding up on the north, east, and west sides, leaving the top and south side open is desirable. Place roosts 4 feet below the top. Feed oats, wheat screenings, corn on very cold days, and keep a pile of hard coal ashes or sand for grit.

Last year we raised 90 turkeys to maturity from eight hens, besides selling all the first eggs at \$1 each. They are nearly clear profit until the first snow comes. Think of all the worry and trouble we have missed. If you could only see the nice large healthy flock we have, wild enough to look graceful, and at the same time tame enough to handle. We have never known of black head or any other disease in our flock.—L. L.

MARKETING A BETTER EGG.¹

POULTRY producers' marketing associations are proving of great benefit among reclamation farmers, and an increase in the number of associations and in the amount of annual business is noted by the United States Department of Agriculture.

Although based on a principle that has been useful ever since there has been human society—the principle of united effort for the common good—poultry marketing associations or any cooperative associations will prove of benefit only in proportion to what the individual members put into them.

A large proportion of the men and women who have enterprise and vision enough to become active in marketing associations are progressive poultry raisers and will look to the high standard of their individual product. But there is always a temptation for a few laggards to think the association will do everything for them. No association of any kind will bring success to the man whose motto is "Let George do it."

No marketing association will be able to establish its brand unless methods are employed to maintain a uniform standard, as near the highest as possible; and a uniformly high standard can not be maintained without the individual effort of every member. Even rigid inspection at the marketing center can not make up for lack in this respect.

WHAT THE CONSUMER SHOULD HAVE.

A product must be placed in the hands of the consumer which is carefully produced and properly

graded and standardized. Furthermore, the product must be marketed through those channels of trade which require minimum margins between producer and consumer, and must be advertised in such a way as to give a distinctiveness to the product of each association or region.

Three factors in production are of the utmost importance:

- (1) Proper feeding and care of the flock.
- (2) Proper condition and care of the nests and yards.
- (3) Proper care and handling of the eggs.

Each of these factors is worthy of separate discussion and needs careful consideration. But unless those members who give their flocks proper care and feed and do all things necessary to produce the highest standard quality of product are offered an incentive or given a reward for this effort in the form of a higher price for their product, they will not continue long to be satisfied with the work or methods of the association.

It is imperative that the producer be encouraged to improve his products if the association is to be able to make progress in placing on the market a product for which it can demand the highest market price.

An ungraded, unstandardized product is one that is more or less uncertain in quality. It may vary greatly in average quality, sometimes showing good quality, but often showing very poor. The marketing of such goods is never advised, since it puts an unnecessary and unwarranted handicap on the product, for,

- (1) The buyer never knows what quality he will receive.

¹ From paper prepared by R. C. Potts, Bureau of Markets, for New Jersey Poultry Producers' Association.

(2) The buyer must take certain risks in purchasing, for the quality may run very inferior.

(3) The buyer, in order to protect himself against loss, must pay a correspondingly low price.

(4) The producer or shipper is often very much dissatisfied with the returns received.

A poultry producers' marketing association, appreciative of these facts, must deal in well-graded, standardized products; and to that end must employ such methods of candling, grading, packing, and marketing as will produce the desired results. Obviously it must market only well-graded eggs, for the advantages to the association and to its members are very many. Furthermore, graded eggs are always received with favor in the market, because:

(1) A basis has been established whereby the buyer knows, within reasonable limits, the quality of the product.

(2) Customers are always pleased with the appearance and quality of the product.

(3) Producers are encouraged to greater effort in improving quality because of the increased returns obtainable.

(4) Consumption is greatly stimulated, for the consumer may purchase a dependable quality and supply.

GRADES TO SUIT TRADE.

In marketing eggs the grades should be standardized according to the requirements of the various classes of trade to which they are to be sold. The standards or requirements of each grade should be based on the actual natural differences in quality, and the quality factors employed should be those which consumers generally recognize. An important feature of the grading or standardizing of eggs is the establishment of the basis requirements for each grade and rules for the candling and grading so that the eggs, when marketed to the various classes of trade, will command the highest market prices.

Without seeking to make any unfavorable comparisons, the various classes of consuming trade may be listed as follows:

(1) High-class family and leading hotel trade; also fancy restaurant trade.

(2) Middle-class family and second-class hotel and restaurant trade.

(3) Low-class family and restaurant trade.

(4) Manufacturers, including bakers.

Naturally, high-class family and high-class hotel and restaurant trade will demand higher quality eggs and will pay higher prices for the best quality than will middle or low-class trade. If this high-class trade is to be cultivated and the highest market price is to be obtained, the quality of eggs must be satisfactory. Furthermore, if producers are to be encouraged to produce the higher quality of eggs they must be paid a premium for producing such eggs. To

obtain these results and be able to serve all classes of trade according to their requirements, a quality basis must be established on which producers are paid and on which the eggs are sold to consumers. This basis should be as simple and yet as well and clearly defined as possible.

There are six primary quality factors to be considered in grading eggs and three secondary factors. These secondary factors relate chiefly to appearance and weight. The nine factors are:

PRIMARY.

Shell (soundness).
Air cell (size).
Yolk (condition).
White (condition).
Germ (development).
Mold (presence of).

SECONDARY.

Size (uniformity).
Weight (per dozen).
Color (uniform or mixed).

Each of the primary factors affects the quality of the egg, while the secondary factors may be used as a basis of separating eggs of the same quality into classes according to size, weight, and color—factors which naturally would most appeal to the higher classes of trade, and, consequently, in grading and packing eggs for the trade they would be given more consideration than when the lower-class trade is supplied.

For purposes of grading eggs to meet the requirements of the four recognized classes of trade, four basic grades may be established, with the following specifications for each:

SPECIALS.

Size (uniform).
Shell (strong, sound, stain-free).
Air cell ($\frac{1}{8}$ inch or less).
Yolk (dimly visible).
White (firm and clear).
Germ (no development).
Mold (free).
Weight (extra large, 28 ounces per dozen; medium, 23 to 27 ounces per dozen; pullets, 22 ounces or less per dozen).
Color (whites, browns, or mixed).

EXTRAS.

Size (reasonably uniform).
Shell (sound, stain-free).
Air cell ($\frac{1}{4}$ inch or less).
Yolk (slightly visible).
White (firm).
Germ (no development).
Mold (free).
Weight (same as for specials).
Color (whites, browns, or mixed).

FIRSTS.

Size (variable).
Shell (sound, practically stain-free).
Air cell ($\frac{1}{2}$ inch or less).

Yolk (visible but mobile).
 White (reasonably firm).
 Germ (not over $\frac{1}{8}$ inch in diameter).
 Mold (free).
 Weight (medium and pullets).
 Color (whites, browns, mixed).

SECONDS.

Size (greatly variable).
 Shell (practically sound, 5 per cent or less stained).
 Air cell ($\frac{1}{8}$ inch or less, lower surface uneven).
 Yolk (fairly heavy, but mobile).
 White (weak, watery).
 Germ (well developed, but no blood ring).
 Mold (free).
 Weight (medium and pullets).
 Color (mixed).

Two grades of "dirties" may be fixed, No. 1 and No. 2, corresponding to "Firsts" and "Seconds" with the exception of clean shell. Checks and cracks would comprise one class and may be marketed as such, or they can be broken out and marketed as liquid or frozen whites, frozen yolks, or frozen mixed whites and yolks.

In order for associations of producers to receive, candle, grade, and pack each member's eggs, it would be necessary to establish one or more receiving, candling, and grading stations or warehouses. These stations would be equipped with candling rooms and equipment. Competent persons would be employed to candle the eggs received.

Much time in candling and grading the eggs would be saved if the cooperation of the members were obtained in grading the eggs on the farm according to the rules of the association. The members could easily sort their eggs according to size, color, and quality. This could be done on the farm as the eggs are packed into the fillers in the carrier or case in which they are delivered to the association's candling stations. Then at the stations the candlers would quickly candle the eggs for quality and check them out for size and color into the final packages in which they are marketed by the association. The sorting of the eggs on the farms would reduce the expense at the station and thus lower the cost of handling and marketing by the association, with larger net returns to the members.

A memorandum receipt showing the quantity and quality of eggs received from each member would be furnished and final payment would be made according to the methods adopted by the association.

APPEARANCE OF EGGS IMPORTANT.

In marketing a high-quality product it is essential that the appearance of the product and also the package be the best. It is desirable that the package be neat and attractive and the method of packing such as to insure sound and perfect eggs. The printing on the package should be suggestive of the superior and distinctive quality of the product marketed

by this particular association. An association slogan, to be used in all advertising, is very helpful, especially if it be attractive. Such slogans as "Jonesville Whites are favorites," or "Franktown Full-Shell Breakfast Eggs," or "Pleasant Valley Later-Laid Breakfast Eggs" are quite significant.

The final marketing and sale of the eggs will require the establishment of contacts with the jobbing and retail trade and the perfecting of a sales organization which will actually sell the product of the association. No doubt finally a large volume of the sales will be made direct to retail stores and to first-class hotels, these sales being handled direct from the main office and delivery made in the association's branded cartons, containing one dozen eggs each. But for some time it will be necessary to place solicitors or salesmen in the markets to solicit trade and obtain contracts or orders for eggs to be shipped regularly by the association.

The more pains the individual members take in producing high-class eggs and properly grading them, the more quickly the association's brand will become recognized in profitable markets.

APPRECIATION FROM PHILIPPINE GOVERNMENT.

The Reclamation Service is in receipt of the following letter from Mr. Dignisio Jakosalem, Secretary Department of Commerce and Communications, Government of the Philippine Islands:

MANILA, P. I., June 28, 1921.

UNITED STATES RECLAMATION SERVICE,

Washington, D. C.

GENTLEMEN: It affords me a great pleasure to transmit to you statements of Mr. Nicanor Cortes, a Government pensionado, who recently returned from the United States, as follows:

A spirit of cordiality and helpfulness was shown to my colleague, Mr. Angel Martinez, and myself by all the managers and technical employees of irrigation projects, factories of pumps and other irrigation appliances and supplies, and the different offices visited. It was through the effective cooperation given Mr. Martinez and myself and through the exceptional facilities given us that I derived whatever of value from my visits to different projects and offices.

Grateful acknowledgments are due to all the different irrigation projects, factories, and offices visited. However, I wish to mention particularly the United States Reclamation Service, with which organization I stayed an aggregate length of time of well over three months. The managers and engineers of the United States Reclamation Service made my stay in their projects and offices not only very profitable, but also enjoyable. I wish to mention also the Bean Spray Pump Co., of San Jose, and the Superior Manufacturing Co., of Lodi, Calif., for the courtesy extended to Mr. Martinez and myself in the study of the manufacture of pumps and the operation of numerous pumping plants in the Sacramento and San Joaquin Valleys, Calif.

In this connection I wish to state that such generous cooperation which you have given to our pensionados never fails to arouse in them as well as in the people who sent them appreciative feelings of gratitude.

Yours, very truly,

DIGNISIO JAKOALEM, *Secretary.*

"GET ACQUAINTED" WRITE-UPS.**Francis M. Goodwin, Assistant Secretary of the Interior.**

FRANCIS M. GOODWIN, Assistant Secretary of the Interior, though a native of Maryland, has spent 20 years of his life in the West and is essentially a Westerner. He hails from Spokane, Wash., the heart of a land of sunshine and low rainfall; consequently he knows the problems of irrigation and reclamation from first-hand sources.



Hon. Francis M. Goodwin.

In addition, Mr. Goodwin is also well acquainted with the Government machine. He was at one time Clerk to the House Committee on Engrossed and Enrolled Bills. In 1901 he was appointed Special Agent of the General Land Office, being later promoted to Chief of Field Division upon the reorganization of the field force and the establishment of the Field Division offices. During this period he saw service in Michigan, Minnesota, Montana, Idaho, Washington, Oregon, Utah, and Alaska, and had charge of the prosecution in the courts of a number of the prominent land-fraud cases during the Roosevelt régime. He was also appointed and served as a member of the commission which investigated and reported on the operation of the public-land laws, Mr. Goodwin devoting his attention chiefly to the operation of these

laws as they affected desert lands. During this period Mr. Goodwin visited and inspected with Mr. Newell, the then head of the Reclamation Service, a number of the proposed reclamation projects since developed in Montana.

Mr. Goodwin resigned as Chief of the Field Division in 1907, and was thereupon appointed Special Assistant to the United States Attorney General, in which capacity he served for a short time.

In the fall of 1907 Mr. Goodwin opened a law office in Spokane, Wash., his headquarters for some four years prior to that time, and was actively engaged in the general practice of the law when appointed Assistant Secretary of the Interior in May of this year.

During his residence in the State of Washington Mr. Goodwin was an active figure in the civic and political life of that commonwealth and is well known throughout several Northwestern States, where he was frequently called upon for public addresses. His activity as a member of the legal profession brought him in touch with important litigation, and especially with public land, irrigation, mining, and power-site matters. He is intensely interested in the proposed Columbia Basin reclamation project, the biggest single irrigation development ever proposed in the United States, or perhaps in the world, with a prospective irrigable area of more than one and three-quarter million acres.

In 1913-14 Mr. Goodwin was engaged as Chief Prosecutor for Spokane County, Wash., and passed through a stormy but successful term of office in that capacity.

Mr. Goodwin was nominated for Congress in 1912, the year of the split in the Republican Party, but was defeated by a narrow margin.

Mr. Goodwin was born in the coal-mining region of western Maryland. The early death of his father, a Civil War veteran, forced him into the coal mines at an early age. Afterwards he attended private schools in Baltimore; became a newspaper man; studied law; graduated from the Maryland University in 1896; and began the practice of law in Baltimore. He has traveled over every portion of the United States and Alaska, and is familiar with the many diversified interests that are handled by the Interior Department. He was particularly pleased at his appointment as Assistant Secretary, because it enabled him to renew old friendships with many who are scattered through the various bureaus of the Interior Department. Among others who were in the service when Mr. Goodwin was Chief of Field Division is the present First Assistant Secretary, Mr. Edward C. Finney, who was at that time in the General Land Office and handled a portion of the field work reported from Mr. Goodwin's office.



Reclamation Service Contract on Boise Project Interpreted by Court.

UNDER a contract by which the Government took over the canal system of an irrigation company for the purpose of incorporating it in a larger Government project and providing that "an equitable proportion of the cost of maintaining and operating the system of irrigation works which may be constructed by the United States on the south side of the Boise Valley, as may be determined by the Secretary of the Interior, shall be paid to the United States by the holders of said certificates of stock," the fact that during the construction of the Government project the manager made charges for water furnished such stockholders on a different basis, held not to affect the right and duty of the Secretary, after completion of the project, to make the apportionment as expressly provided in the contract. Where the meaning of an instrument is clear, error in its construction by the parties can not control its effect. (*New York Canal Co., Limited, v. Bond et al.*, 273 Fed., 825.)

Survey of Public Land Abutting Stream of Water.

The following holdings relating to the survey of public land abutting a stream of water are taken from the decision of the Supreme Court for the State of Montana in *Bode v. Rollwitz et al.* (199 Pac., 688), to wit:

Where, in the survey of the public domain, a body of water is found to exist and is meandered, the result of such meander is to exclude the area from the survey, and to cause it as thus separated to become subject to riparian rights of the respective owners abutting on the meandered line in accordance with the laws of the several States.

A Government surveyor is not invested with authority to determine the character of land surveyed or left unsurveyed or to classify it as within or without the operation of particular laws, and his error in failing to extend his survey over islands in a river did not make them less a part of the Government domain, and the Government was not thereby divested of title or prevented from subsequently surveying them and asserting title thereto.

That administrative Government officers, before discovery of a surveyor's error in failing to survey islands in a river and including them as part of a

meandered tract shown in the river, had treated such a meandered tract as subject to the riparian rights of abutting owners, under State laws, could not estop the United States from asserting its title even as against such an owner, who had acquired his property before the mistake was discovered.

Patents to lots of land abutting on a river do not include actual islands of fast dry land of stable foundation lying between the lots and the thread of the stream.

While the courts have nothing to do with public land surveys or the revision thereof, yet they may determine whether lands have been left unsurveyed and whether a right of possession exists under an inceptive claim.

Although islands in a stream were in possession of plaintiff and her predecessor for over 30 years, no title to them was thereby acquired; they being Government land.

Trespass on Public Lands for Oil.

Where a trespasser extracted and sold oil from public land, claiming under a mineral locat on made with knowledge of an order of the Interior Department withdrawing the land from "settlement and entry or other form of appropriation," and that the land department had construed such order as barring mineral locations, the fact that he sought and obtained an opinion from counsel giving a contrary construction to the order, can not justify the trespass as one made in good faith, so as to affect the measure of the trespasser's liability. Such trespasser is liable for the value of the oil so taken without deduction for the cost of its production. The public domain is not at the mercy of State legislation or decisions and the measure of recovery for such trespass is not governed by local laws or decisions, but by general principles having uniform operation in all Federal courts. (*Masons et al. v. United States (La.)*, 273 Fed., 135.)

Percolating Waters in California.

Percolating waters are almost invariably found in permeable material of more or less density such as sand, gravel, and boulders intermixed, in which the water will move readily by the force of gravity. The original title to such water was in the owner of the land in which it is found, under the elementary rule that the title and ownership of land extends to the

center of the earth, and includes everything within the cone having the superficial boundaries of the land for the base and the center of the earth for its vertex. The transfer of the land by the Government to the individual passed this title, and gave the landowner the right to all the water therein. Originally in California it was assumed that this title was absolute, and that each landowner could take out as much of such underground water as he pleased, regardless of the effect thereof on other lands, provided he took it on his own land, and without a malicious intent to injure others. But the immediate effect of such taking of water out of such land usually is to draw out the water from the surrounding land into the void or depression caused in the water plane in the land from which it is taken, and this, if continued, lowers the subsurface water plane in the vicinity thereof, and eventually, to a greater or less extent, throughout the basin in which the lands are situated. If there is artesian pressure therein, this will reduce the pressure. In this manner the owner of one tract of land in such basin could take such water from another tract without an actual trespass thereon, and thus an injury could be done which the owner of the other tract could not prevent by any lawful physical means, and a resort to the courts was necessary. In cases presenting these facts the original assumption of absolute ownership in such water was held untenable under the conditions existing in California, and the doctrine that the respective rights of owners of land in the waters percolating or lying beneath the surface are reciprocal and correlative as to each other was adopted. Each owner of land overlying the same general underground supply of water may take such water on his own land for any beneficial use thereon, so long as such taking works no unreasonable injury to other land overlying such water. If the natural supply is not sufficient for all such owners, each is entitled only to his reasonable proportion of the whole, and each may apply to the courts to restrain an injurious and unreasonable taking by another, and to have the respective rights adjudicated and the use regulated so as to prevent unnecessary injury and restrict each to his reasonable share. With respect to other parties who take for use on lands outside the watershed of the basin, it is now established that no one, not even the owner of overlying land, has the right to take water out of the watershed for any purpose, if such taking will deprive of water any lands within the basin; that, while the owner of overlying land who does not use such water thereon, and whose land is not injured by an exportation of the water to outside lands, has no right to enjoin such exportation, he may nevertheless apply to the court for a judgment declaring his own right to be paramount, and that such exportation is subordinate to his own right, and enjoining the taker from making an adverse claim to the water, or from taking it in such

quantities or in such a manner as to destroy or endanger the source of supply. (*City of San Bernardino v. City of Riverside*, 198 Pac., 784.)

Land Patents to Incapacitated Ex-Service Men.

The act of March 1, 1921 (Public, No. 351, 42 Stat., —), providing for issuance of patents to incapacitated ex-service men, is an amendment of the homestead law but does not abrogate the provisions of the reclamation law regarding reclamation of one-half of the irrigable area and payment of water charges. These two laws are separate and distinct. The act of March 1, 1921, does not require patent to issue for lands under Federal irrigation projects before submission of final affidavit approved by the project manager, showing reclamation of one-half the irrigable area of the entry and payment of all fees, commissions, and water charges to date of such approval. (Departmental decision, re Claude E. Barber, Belle Fourche project, Aug. 3, 1921.)

Congress Consents to Agreement Between States Respecting Waters of Colorado River.

An Act To permit a compact or agreement between the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming, respecting the disposition and apportionment of the waters of the Colorado River, and for other purposes. [Act Aug. 19, 1921, Public, No. 56, 42 Stat., —.]

Whereas the Colorado River and its several tributaries rise within and flow through or from the boundaries between the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming; and

Whereas the territory included within the drainage area of the said stream and its tributaries is largely arid and in small part irrigated, and the present and future development necessities and general welfare of each of said States and of the United States require the further use of the waters of said streams for irrigation and other beneficial purposes, and that future litigation and conflict respecting the use and distribution of said waters should be avoided and settled by compact between said States; and

Whereas the said States, by appropriate legislation, have authorized the governors thereof to appoint commissioners to represent said States for the purpose of entering into a compact or agreement between said States respecting the future utilization and disposition of the waters of the Colorado River and of the streams tributary thereto; and

Whereas the governors of said several States have named and appointed their respective commissioners for the purposes aforesaid, and have presented their resolution to the President of the United States requesting the appointment of a representative on behalf of the United States to participate in said negotiations and to represent the interests of the United States: Now, therefore,

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That consent of Congress is hereby given to the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming to negotiate and enter into a compact or agreement not later than January 1, 1923, providing for an equitable division

and apportionment among said States of the water supply of the Colorado River and of the streams tributary thereto, upon condition that a suitable person, who shall be appointed by the President of the United States, shall participate in said negotiations, as the representative of and for the protection of the interests of the United States, and shall make report to Congress of the proceedings and of any compact or agreement entered into, and the sum of \$10,000, or so much thereof as may be necessary, is hereby authorized to be appropriated to pay the salary and expenses of the representative of the United States appointed hereunder: *Provided*, That any such compact or agreement shall not be binding or obligatory upon any of the parties thereto unless and until the same shall have been approved by the legislature of each of said States and by the Congress of the United States.

SEC. 2. That the right to alter, amend, or repeal this Act is herewith expressly reserved.

Congressional Bills of Interest to Our Readers.

IN THE HOUSE.

H. R. 7908.—"A bill to authorize and regulate the grazing of live stock on the public domain, and for other purposes," introduced July 25, 1921, by Representative N. J. Sinnott, of Oregon.

H. R. 8106.—"A bill extending the provisions of the act of February 25, 1919 (Fortieth Statutes at Large, p. 1161), relating to credit under the homestead laws for military or naval service, and for other purposes," introduced August 8, 1921, by Representative N. J. Sinnott, of Oregon.

IN THE SENATE.

S. 1915.—"A bill to provide for the purchase of farm products in the United States, to sell the same in foreign countries, and for other purposes." July 27, 1921, Senator William E. Borah, of Idaho, and Senator Henry F. Ashurst, of Arizona, submitted two separate amendments to this bill each intended to permit the making of Federal farm loans on Federal irrigation projects without reference to the Government's liens for water charges.

S. 2268.—"A bill for a commission to study the questions of land settlement and home ownership in the United States," introduced July 18, 1921, by Senator Morris Sheppard, of Texas.

S. 2389.—"A bill authorizing Federal land banks to make loans on lands within irrigation projects and giving priority of lien for loans so made," introduced August 11, 1921, by Senator Thomas Sterling, of South Dakota.

S. 2439.—"A bill for the relief of West Okanogan irrigation district, in the State of Washington," introduced August 22, 1921, by Senator Miles Poin-dexter, of Washington.

—Ottamar Hamel.

A systematic marketing of all the surplus products of the farm is just as important and essential as the production of them. This surplus may be said to represent the year's business in farm management.

OREGON COOPERATIVE HAY GROWERS.

By L. A. Hunt, Manager, Oregon Cooperative Hay Growers' Association.

THE farmers who are left on the Umatilla project have faced for the last several years an over-production of alfalfa hay. Dairying has been resorted to to quite an extent, but has by no means proved a universal solution in taking care of this surplus hay; one of the reasons probably is that nature probably never intended more than one man out of every four to be a dairyman. Another reason is that of the heavy cost of pasture on high-priced reclamation land. The market of 1920 and the experience of the California market condition have been the arguments to convince the alfalfa growers that it was a straight marketing problem and that it was really up to them.

In September, 1920, a meeting was called, creating a temporary organization for the particular purpose of studying existing marketing plans and drafting the best possible plan to meet the local situation. A committee of nine was selected to undertake the details of this work, with instructions to report something definite the first of May. No body of farmers ever accepted a commission more seriously or gave more loyally of their time and money in working out this problem.

They reported on schedule time and at a mass meeting held at Hermiston the farmers unanimously indorsed the plan as outlined and proceeded with an active campaign for members. The committee reported for a contract modeled after the California marketing associations and embodying their fundamental principles. It is a 3-year, ironclad, non-profit, pooling contract. The minimum sign-up was secured and their first meeting for election held, which resulted in the election of a board of directors, of whom F. L. Jewett, Hermiston, was chosen president. Other directors are I. A. Berger, Boardman; Eli Winesett, Hermiston; George Beddoe, Columbia District; Rex Sanford, Stanfield; Will Reeves, Stanfield; Lee Savely, Echo.

They immediately organized and hired as manager L. A. Hunt, formerly Morrow County agricultural agent, and proceeded to finish the canvass for memberships.

The Umatilla project lies near the center of the hay district of eastern Oregon, which for the last two years, in addition to taking care of large sheep and cattle industries during the winter, has made an annual export of 50,000 tons of choice alfalfa hay.

One of the first results secured by this organization was the State inspection and certification of grades and weights of hay at loading points. The lack of this inspection at shipping point has been one of the greatest handicaps which the local shipper has faced in past years.

The plans of this association contemplate reaching out and including all the alfalfa districts of Oregon, and they have already entered into an alliance with the farmers on the Yakima project for a joint selling agency with them. It is hoped that we may later include Idaho in this.

A careful analysis of the situation seems to prove that there is no doubt that the association will be able to realize from \$2 to \$4 per ton more than can be realized by hay shipped through individual dealers.

The organization will specialize in selling on State grades and shipment to consumers direct. Efforts are being made to secure a reduction in the present freight rate.

The eastern Oregon country is famed for its hay, which is produced in the face of the handicap of inadequate marketing facilities. It is hoped that the present plan will overcome these difficulties. The farmers are loyally supporting the organization and it is estimated that at least 30,000 tons will be handled this first year.

OPERATION OF STRAWBERRY RESERVOIR, STRAWBERRY VALLEY PROJECT, JANUARY, 1913, TO JULY, 1921.

By W. L. Whittemore, Project Manager.

STRAWBERRY Reservoir, the chief source of water supply of the Strawberry Valley project, is located in Wasatch County, about 28 miles east of Provo, Utah.

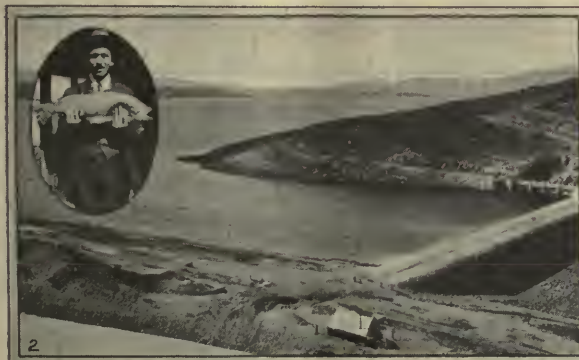
The reservoir is formed by impounding the waters of Strawberry River, a tributary of the Duchesne River of the Colorado River drainage basin, in Strawberry Valley, a natural reservoir site, lying between two spurs of the Wasatch Mountains, near the headwaters of the stream.

The waters thus impounded are conveyed by Strawberry Tunnel a distance of 20,000 feet, through the rim of the Great Basin, into the headwaters of Diamond Fork Creek, a tributary of the Spanish Fork River, and thence down the natural channels of these streams to Spanish Fork Diversion Dam, a distance of 27 miles, where they are diverted and distributed to the irrigable area.

The drainage area of Strawberry River above the impounding dam is 175 square miles. The maximum run-off into Strawberry Reservoir during the period of operation, January, 1913, to July, 1921, is 104,000 acre-feet; the minimum, 39,000 acre-feet; and the mean annual run-off, 72,000 acre-feet.

The irrigable area under the project is approximately 55,000 acres; 35,000 acres, under the Spanish Fork, Mapleton, and Springville Divisions, may be classed as old lands with partial water rights from the Spanish Fork River, Hobbie and Maple Creeks, and these are dependent upon the United States for a late supply of water; 20,000 acres, under the High Line Division, may be classed as new lands without previous water rights and dependent upon the United States for furnishing their water supply.

The first water for irrigation purposes was turned from Strawberry Reservoir during the irrigation season of 1915, and was used as a supplemental supply for 10,000 acres of land under the Spanish Fork Division. During 1916, on completion of the High Line Canal and lateral system, the Service was prepared to serve 28,000 acres, practically all of which was irrigated. During 1917 the completion of the canal and lateral system in Goshen Valley added 5,000 acres under the High Line Division, and in 1918 completion of Mapleton Lateral served an additional 10,000 acres under the Springville and Mapleton Irrigation Districts, bringing the irrigable area



1. A 12½-pounder. 2. General view of Strawberry Reservoir showing Strawberry Dam, wasteway bridge, and spillway. 3. Wasteway bridge and spillway in operation at north end of Strawberry Dam, June 1917.

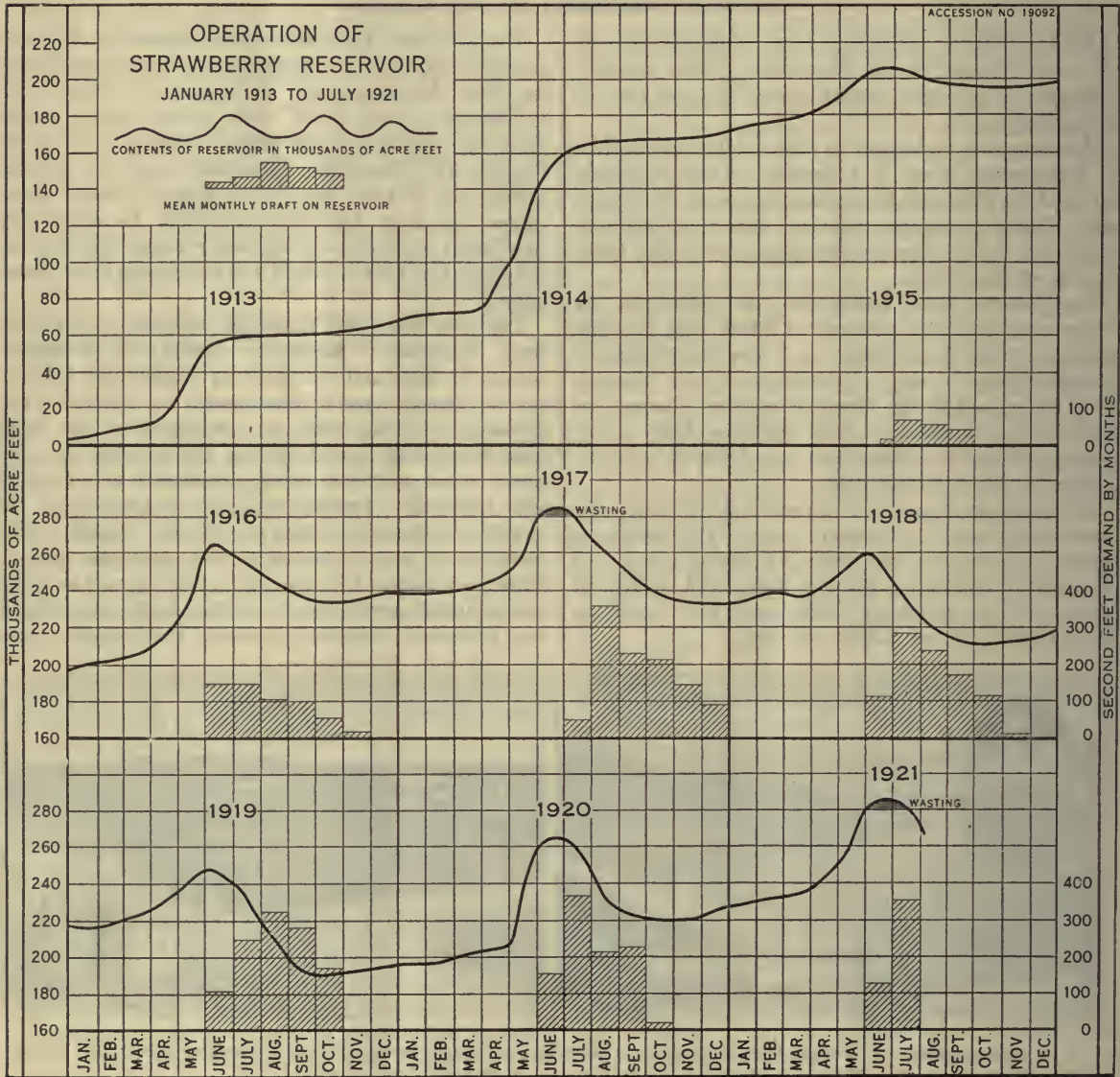
of the project to about 55,000 acres for which the Service is prepared to furnish water.

The maximum available capacity of Strawberry Reservoir is 250,000 acre-feet, or more than three times the estimated mean annual draft required for irrigation purposes. This surplus capacity permits averaging the run-offs of Strawberry River so that the surplus of one year is held in the reservoir for use during the next. The inflow into the reservoir from all sources, together with the normal precipitation, are sufficient to keep the surface of the reservoir practically stationary during the summer months if no water is used for irrigation purposes.

The Strawberry Dam which impounds the water is an earth-filled structure 72 feet high and 485 feet

long, with concrete core wall. The upstream slope is paved with limestone blocks, the downstream slope covered with loose rock for about two-thirds of its height. A spillway 60 feet long for carrying approximately 2,000 second-feet has been constructed at the north end of the dam and provided with suitable waste-way channel, lined with concrete, for conveying the surplus waters about 500 feet downstream from the dam.

In order to confine the reservoir and prevent undue evaporation losses, it was necessary to construct a low dike 35 feet high and 1,310 feet long across a saddle between Strawberry and Indian Creek valleys. This dike is similar in construction to Strawberry Dam, except that no spillway is provided.



Part of the waters of Strawberry River were first impounded during the fall and winter of 1912, behind the completed portion of Strawberry Dam.

The accompanying diagram shows the fluctuations in the contents in acre-feet of Strawberry Reservoir, together with mean annual draft on the reservoir, from January, 1913, to July, 1921.

The reservoir was filled to capacity for the first time on May 26, 1917, and for the second time on May 27, 1921. The surplus waters of the reservoir wasting over the spillway at Strawberry Dam amounted to 32,300 acre-feet in 1917 and to 12,500 acre-feet in 1921.

The surrounding watershed and area inundated by the reservoir, embracing some 52,000 acres, were purchased from the Uinta Indians under the act of April 4, 1910 (36 Stat., 285), to prevent overgrazing and soil washing. The act provides that "all right, title, and interest of the Indians in the said lands are hereby extinguished, and the title, management, and control thereof shall pass to the owners of the lands irrigated from said project whenever the management and operation of the irrigation works shall so pass under the terms of the reclamation act." These lands, by Federal and State statutes, form a temporary bird reserve and are now leased under con-

tract to the Strawberry High Line Canal Co., a water users' association, for grazing purposes. They are capable of supporting about 30,000 head of sheep, or 6,000 head of cattle and horses each year from May 15 to October 15.

Strawberry Reservoir, because of its accessibility, picturesque location, and excellent fishing, is becoming more and more each year the mecca of camping parties, tourists, and sportsmen. The high altitude of the reservoir, with its attendant cool nights, affords relief during the hot summer months and the excellent fishing in the reservoir and adjacent streams makes it a paradise for nimrods.

All boats on the reservoir are licensed by the United States, and during the past season 51 boats were in use. Camping concessions are permitted and many water users are contemplating the construction of summer cottages along the shores of the reservoir for camping and pleasure purposes.

The reservoir is accessible to the public over excellent roads, either from Spanish Fork or Provo Canyon. The proposed line of the Salt Lake & Denver Railroad approaches within 2 miles of the reservoir and if constructed will make Strawberry Reservoir the gathering place during the summer of numbers of vacationists and tourists.

UNCOMPAHGRE RIVER FLOOD, JUNE, 1921.

By L. J. Foster, Project Manager, U. S. R. S.

THE Uncompahgre Valley experienced a disastrous flood during the middle of June, when a record flood condition of some 3,900 second-feet was reached on June 11 and continued for several days. On the night of June 14, after a steady and heavy rain over the entire watershed, the river rose to a stage of somewhere between 4,300 and 4,500 second-feet at the upper end of the valley. The usual seasonal flood discharge of the Uncompahgre River as far back as 1898 ranges from 1,500 to 2,450 second-feet. The stage reached by the flood of 1921, therefore, was approximately twice as great as that attained during any known past flood.

The ordinary channel was not sufficient to take care of this large volume of water and as a result during the flood week much damage was done to project works, private ranches, the Denver & Rio Grande Railroad track, and county roads and bridges.

The Uncompahgre River is used as a distributing channel for six of the main canals and for two of the smaller laterals. One other main canal is also partially fed by a feeder ditch from the river.

WEST CANAL SYSTEM.

On June 15 part of the river cut through its left bank several hundred feet above the feeder-ditch diversion. This overflow passed into the feeder ditch

and also into the main canal across the bottomlands and before the necessary cuts could be made in the banks of the Main Canal to give relief to the overflow the side hill section was breached at two different places where the bottom of the canal was from 5 to 6 feet above the level of the adjacent lands. The river overflow also backed up into the diversion flume from the South Canal over the river and overflowed the flume for a distance of some 128 feet at its lower end.

The P. & H. dragline was moved to the sidehill breaches and the repair work at these points was completed in 6 days with the dragline operating on a two-shift basis of 10 hours each. Three days were required to turn the river back into its own channel and close the 315-foot gap in the river bank; the work was accomplished by means of bundles of trees anchored with rock baskets.

MONTROSE & DELTA CANAL SYSTEM.

On June 15, about 3 p. m., during the height of the flood, the water suddenly lowered on the gage in the approach section to the headworks 1.8 feet in a few minutes. This lowering of the water was due to the failure of part of the timber dam control floor and the sheet piling cut-off walls across the river. Suction action was then exerted on the filled material

between the 4 by 12 sheet piling on the left bank of the river and the concrete retaining wall of the headworks, and this action continued until all of the filled material had been sucked away.

The concrete apron drop that had been placed during the winter of 1918-19 below the operating dam to prevent washing was partially broken up and washed out. The operating works on the right side of the river below the operating dam are protected by a line of sheet piling and the resultant action of the flood water after the partial loss of the concrete apron caused a washing and undermining action on the piling until about 30 feet of such piling had been lost.

The damage to the Montrose & Delta headworks and the necessary temporary repair work did not at any time interfere with the continuous regulation and operation of the canal.

LOUTSENHIZER CANAL SYSTEM.

Minor damage only was done to the headworks of this canal, although it was necessary to place some 230 feet of trees and rock basket riprap work on the right bank of the river below the dam in order to protect the headgate tender's house.

SELIG CANAL SYSTEM.

The Uncompahgre River, a short distance above the headworks for this system, makes a sharp bend to the right, and on June 13 the river started to flatten out this bend by cutting a new channel through a 5-acre orchard. During this action the river also overflowed its left bank and threatened to cut a new channel to the left and leave the Selig headgate high and dry on the east side.

A gang of men was employed at this point for two days in placing a line of Page wire fencing 600 feet long faced with trees and willow bundles to hold the river until the new channel had been completely cut through the orchard. The controlling works of the Selig headgates were protected on the left side of the river by a line of sheet piling 100 feet long which extended from the operating dam to the abutment of

the county bridge. On June 16 the river began undermining the bridge abutment and worked down along this line of protective piling. Shortly after this action was noted a 10-foot section of piling immediately adjacent to the bridge undermined and permitted part of the river to turn in the breach. Soon after the county bridge, which was supported on three bents across the river and which had been in a dangerous condition for some time, collapsed and the sections of the bridge that had been anchored on the west side of the river floated into the remaining piling and bowled them over like tenpins. The result was that the headgate was left high and dry, no water was flowing over the 3-foot dam, and the entire flow of the river passed through the 100-foot gap made in the piling.

In order to make the work of turning the river back into its old channel a little less difficult, part of the dam sections was removed and the gravel training wall was cut. Wire baskets loaded with rock were used to close the gap in the sheet piling; this work was completed on June 21 and it is estimated that some 700 cubic yards of rock were placed in closing the breach.

IRONSTONE CANAL SYSTEM.

The overloaded Uncompahgre River on June 15 began overflowing low sections on its left bank about one-fourth mile south of the sluice works. Several breaches were made in the lower bank of the Main Canal in order to permit as much of the overflow as possible to pass back into the river without going down the Main Canal. Despite this work about 150 cubic feet per second excess water passed down the ditch to the Dry Creek Wasteway, in addition to the ordinary capacity of the canal. No overflow occurred over this 5-mile stretch of canal except at the 504-foot side hill bench flume section about $1\frac{1}{2}$ miles below the headworks. This flume section was originally built with a depth of 4 feet, and in order to protect the lower bank it was necessary to raise the sides of the flume an additional height of 1 foot. The protection work needed above the sluice works in order to turn the overflow back into the river channel required the



1. Looking up Uncompahgre River toward Montrose & Delta Canal operating bridge. Note washed-out piling at left and settlement in part of wall of concrete apron. 2. Homestake headgate washed out and lodged against Olathe Bridge.

placing of 390 feet of sacks and willow brush riprap, 310 feet of tree riprap, 309 feet of sack dam, and 425 feet of hog wire fence faced with willow bundles.

HOME RUN LATERAL.

Irrigation water is raised to permit diversion into the Home Run Lateral by means of a rock basket dam across the river channel. This dam, although not high, prevented the cutting and lowering of the river channel at the diversion point, with the result that some time during the night of June 17 the river cut a channel through the lateral at the left of the headworks and washed these works some distance down the river. The river headworks at this point have been abandoned and the lateral is now fed by a feeder ditch from the Ironstone Canal.

OTHER CANAL SYSTEMS.

Little damage was done by the flood waters of the river at the headworks of the East and Garnet Canal systems and at the headworks of the Chipeta Lateral.

DAMAGE TO OTHER PROPERTY.

The Denver & Rio Grande Railroad track which parallels the Uncompahgre River throughout the en-

tire valley was washed out, owing to changes in the river channel at four different places.

Much damage was done to all county bridges. In some places the river left its old channel and the bridges are now high and dry. In some cases the bridges collapsed entirely, and in still others, although the bridges are intact, the abutments have been undermined.

The river was on a rampage along its entire length and it is believed that not a single bottom-land ranch escaped damage. The movement of gravel was so great that in spite of the fact that the river has now subsided to a normal flow, much damage in cutting is still in progress on the bottom-land ranches.

Much damage was also done to many of the private headgates that divert water from the river for use on the bottom lands. The Ouray, Stark-Volkman, Eagle, and Frost Ditches were in a precarious condition during the flood period. The headgate of the Foster Ditch was left on the opposite side of the river. The Homestake Ditch was washed out and lodged up against the Olathe bridge. Changes in the river channel left the headgates of the Swanson, Boles-Manney, and Uncompahgre No. 3 Ditches high and dry and away from the new river channel.

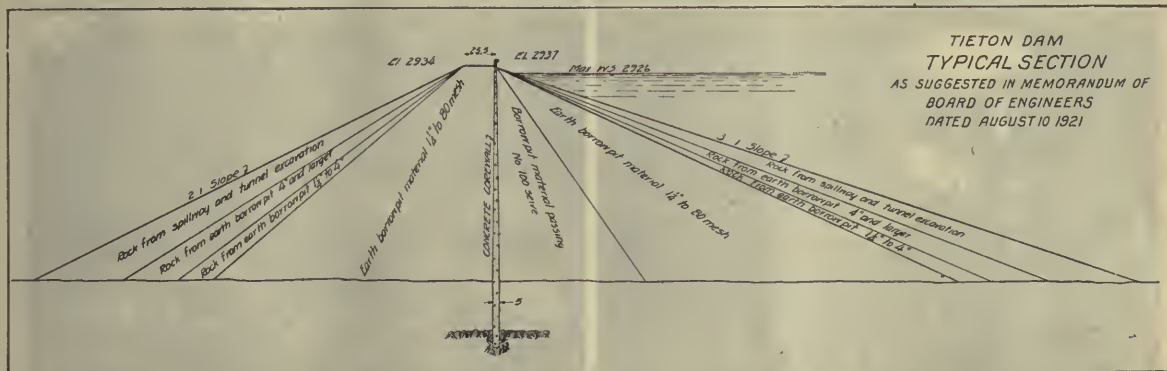
TIETON DAM, YAKIMA PROJECT, WASH.

By F. T. Crowe, Construction Engineer, U. S. R. S.

THE Tieton Dam when completed will create a reservoir having a capacity of 202,500 acre-feet, which will become a part of the storage system for the Yakima project, Washington. It is located in the Mount Rainier National Forest on the Tieton River about 26 miles above Naches, Wash., the nearest railroad point. The dam will be built of earth heavily blanketed with rock, approximately 230 feet high and 900 feet long on the crest, with a concrete core-wall of an approximate height of 330 feet extending from solid rock to the crest.

A very complete camp was built in 1917 to care for 600 men, a temporary power plant was installed with a capacity of 270 K. W., and 1,400 feet of the total of 2,200 feet of diversion tunnel were excavated by the spring of 1918, when, owing to shortage of labor and the extreme war conditions which faced the country, the work was closed down until April 1, 1921, at which time an appropriation of \$675,000 was made available for the work of this fiscal year.

The equipment for a power plant of 1,000 K. W. capacity was purchased during 1918. This has been



installed this year and is now in operation. The water for the plant is obtained by a flume taking out of the Tieton River at the mouth of the diversion tunnel and extending along the hillside for 2,200 feet, where a head of 78 feet is made available. The equipment consists of two horizontal units of 500 K. W. each which produce electricity at 2,300 volts.

A diversion tunnel 2,200 feet long is being excavated with a diameter of approximately 21 feet, which will carry the waters of the Tieton River during the construction of the dam and will be used as a portion of the outlet control system when the dam is completed. This tunnel is through a solid cliff of andesite rock, which is being drilled and shot by the top heading and bench method, the muck being loaded into 4-yard Western dump cars by a Class 45 Bucyrus railroad type shovel remodeled with a short boom and a frame and equipped with 1-yard bucket.

The corewall will consist of a concrete diaphragm completely crossing the canyon and tied well into bedrock on the base and sides. Below the ground surface it will be 5 feet thick with no reinforcing. Above the ground surface it will taper to 1 foot thickness at the top of the dam, being heavily reinforced and without expansion joints. The excavation and placing of this corewall below the ground surface is one

of the features of work being done during the present season. In the river bed it is necessary to excavate to a depth of approximately 110 feet to secure the proper foundation. The excavation tapers on the east side of the canyon to 35 feet in depth, whereas on the west side of the canyon the bedrock is exposed and will require simply the cutting out of a key in the bedrock of about 5 feet in depth. This corewall is being excavated by a method known in mining as stoping. Three principal shafts are sunk to and into the bedrock. At the base of these shafts a large sump hole is constructed and pumps installed. Drifts 6 feet high and 5 feet wide are then driven in each direction along the line of the corewall and into the bedrock a depth of not less than 5 feet and sometimes as high as 30 feet, depending upon the nature of the bedrock, so that the concrete will tie into good substantial foundation. After the lower drift is completed the second floor is excavated by stoping the material through the roof of the first floor into mining cars, thence run to the shafts, caged, and brought to the surface and dumped; thus the material above the lower drifts is never touched with a shovel. It is simply picked or shot down and trapped into the cars. After two floors have been excavated the lower floor is filled with concrete from cars running on the



1. Tieton Dam site from a point about 1,000 feet above the center line. 2. Approximate profile on axis of dam. 3. Remodeled Bucyrus 45 excavating the diversion tunnel. 4. Powerhouse.

completed second floor. The third floor is then excavated and the second floor filled with concrete and a similar operation followed out until the ground surface is reached. Considerable loose and swelling ground is being encountered, together with large quantities of water, and the work is very difficult in the section immediately below the river. However, the method is working out very satisfactorily and is the only one thought practicable, considering the deep excavations required and the nature of the material encountered, as it would be almost impossible to shore up an open trench to such extreme depths.

The embankment will be a hydraulic fill blanketed with rock. It will have a maximum height of approximately 230 feet, a crest 900 feet long with a 3 to 1 slope on the upstream side, 25 feet top width, and a 2 to 1 slope on the downstream side. It is proposed to convey the material for the embankment to the outer slopes of the dam by cars from borrow pits both above and below the dam in which shovels will be operated. A Class 80-B Bucyrus 100-ton electric shovel on caterpillars is being purchased for operation in the borrow pit above the dam and a Bucyrus 45 railroad type, operated by air will be used in the borrow pit below the dam. Eight 16-ton steam locomotives will be provided with seventy-five 4-yard 36-inch gage dump cars. The tracks from these borrow pits will be brought onto the slopes of the dam over trestles at intervals in elevation of about 30 feet. The material will be dumped from these trestles and washed by hydraulic giants to a center pool which will be divided by the core wall. A pump will be installed in the pool immediately below the corewall which will pump a large amount of the soft clayey material from the lower side of the corewall to the upper side of the corewall leaving a fine graded sandy material immediately against the downstream side of the corewall and a tight clayey puddle against the upstream side of the corewall. The volume of the embankment will be nearly 2,000,000 cubic yards.

A spillway will be built in the rock cliff on the west side of the canyon. It will have an overflow lip 420 feet long equipped with 6 drum gates of the Arrowrock type, 65 feet long and 8 feet high. The spillway will have a capacity, under normal conditions, of 30,000 second-feet with a capacity of 50,000 second-feet before the dam would be overtopped. It will discharge through a concrete conduit down the side of the cliff to a pool well below the toe of the dam.

The final design of the outlet control works of the dam has not been completed. It is proposed to have outlets to control the water at three stages so that the gates will never have to operate under a greater head than 80 feet. These outlets will each have a capacity of 2,500 second-feet, which will be the maximum irrigation demand.

RECLAMATION ABROAD.

Irrigation in Mayo Valley, Mexico.

The Mayo River Valley is in the extreme southern part of the State of Sonora, Mexico. Crops can be produced only by means of irrigation. At the present time there are fifteen or twenty canals in private ownership tapping the Mayo River, the canals having the same level as the river and being from 9 to 30 feet in width at the bottom. Nearly every property of importance in this region has its own canals. In the Yaqui Valley, on the contrary, one large irrigation company supplies water for all the farms.

In certain sections of the Mayo Valley groups of farmers have organized into mutual companies for the construction and maintenance of irrigation ditches. Among others is the *Compañia de Irrigacion Independencia*. The group of farmers composing this company divide the available water among themselves and in case of a surplus it is sold to other farmers. The intake of this irrigation system is a little above the village of Etchojoa on the left bank of the Mayo. This system is said to have been constructed ten years ago, and to have been in successful operation for the past six years. It is practically the only system of importance on the left bank of the river in the vicinity of Huatabampo. The main canal has a capacity of 4 or 5 cubic meters per second. As a rule there is an ample supply of water during the months of July, August, and September. After that the river is dry with the exception of a short period toward the end of December and part of January.

The *Compañia Agricola* also owns its own canal, which has its intake below Navojon on the left bank of the river.

The bottom of the river is an average of about 7 feet below the level of the land to be irrigated. There are no dams for retaining or conserving the water supply; hence the farmers are at the mercy of very low stages of the river when no water can be obtained, and at other times the river overflows into the canals leading through the fields and doing great damage.—*From report by Consul Bartley F. Yost, Guaymas, Sonora, Mexico.*

It is estimated that the completed reservoir, including the roads, right of way, and clearing, will cost approximately \$5,000,000 and will be completed in the fall of 1924.

The construction engineer is in responsible charge, reporting to the chief engineer at Denver. The work is divided into five departments; C. E. Crownover has charge of the civil engineering, Claude Gleason the electrical engineering, V. G. Evans is chief clerk, C. A. Lybecker general foreman, and George Nourse master mechanic.

IRRIGATION AND COLONIZATION.

BUSINESS men in general on the Montana projects realize the necessity of doing everything in their power to encourage the settlement and development of these projects. On September 6 a meeting was called in the Milk River Valley, to which representatives of other Montana projects were invited, to decide upon methods to be used in disposing of large tracts of land and to agree upon options satisfactory to both owners and purchasers. In this connection the following statement of principles has been prepared for circulation:

CONSENSUS OF OPINION OF BANKERS AND MERCHANTS OF NORTHERN MONTANA.

1. The prosperity of Montana is bound up in the skillful use of the irrigated lands of the State.

2. Water is the most valuable of the mineral resources of Montana; when beneficially applied to fertile lands, properly tilled, it results in a continuous supply of wealth, in contrast with the irregular and exhaustible supply of gold, copper, coal, and other minerals.

3. Water now available and lands now irrigable, to the extent of tens of thousands of acres, are not being used to their full extent.

4. Failure to properly use these lands is resulting in the business of the State being deprived annually of millions of dollars.

5. This annual loss is attributable to the fact that these irrigated lands are held in tracts too large to be effectively used by the owners, who are financially unable to cultivate them, or are unwilling to sell them at low rates to men who could cultivate them.

6. Experience has shown that 80 acres of irrigable land is about as much as can be effectively cultivated by a farmer of ordinary means and skill.

7. The possession of more than 80 acres of irrigable land by one family results in depriving other families of homes and prevents the community and business men from receiving the full benefit of the proper use of the irrigated land.

8. Such holding of areas of irrigable land in excess of the economic limit of 80 acres is often the result of unwise granting of credit by bankers and merchants. This indiscretion injures the creditor to an extent larger than the gain from the credit granted.

9. Under these conditions bankers and merchants may be considered as having a responsibility and a duty to the State, to the community, and to themselves not to extend credit in such way as to permit, directly or indirectly, the holding of irrigated land from full use.

10. These business men have a duty to unite to promote the full use of the irrigated lands by bringing in experienced farmers who may purchase the lands in 40 or 80 acre tracts.

11. For this purpose the bankers, merchants, or others furnishing credit to the owners of irrigated lands, should endeavor to perfect an organization to secure options at low rates on irrigable lands so that when widely advertised with fixed prices those lands may be available for prospective home seekers.

12. The prices as announced must be sufficiently low to attract desirable purchasers. Good irrigated

land, with paid-up water rights, can be had on easy terms, as for example at Valier, at \$60 per acre.

13. Northern Montana land without water has little value; it is often a liability. The options for the raw, desirable lands should be had at the rate of say \$15 to \$25 per acre and higher with improvements.

14. Purchasers of such lands should be men with families, and carefully "hand picked" with reference to ability and willingness to work, and held to not more than 80 acres to the farm.

15. As these farmers are securing permanent homes and will become neighbors and patrons of the business men of the towns, every effort should be made to see that they are well advised and protected in the selection and purchase of homes and in the layout of the farm.

16. Tenantry should be discouraged. The good tenant should be aided to become a home owner and permanent citizen, his interests being thus reversed from that of "mining the soil" to that of preserving and increasing its fertility.

17. Irrigated farming being a highly specialized industry, requiring the full time and attention of the farm owner, every reasonable effort should be made to discourage men who are securing credit from attempting to conduct two businesses. That is to say, credit should not be advanced to professional men, lawyers, doctors, clerks, nor shopkeepers to enable them to try to operate an irrigated farm in connection with another business. "No man can serve two masters."

18. When an organization has been perfected to bring desirable settlers to the irrigated but unused lands of northern Montana, and these irrigable lands are being put into the hands of settlers, then it may be proper to urge upon the State the desirability of providing credit or funds for the creation of additional irrigation districts, or to urge upon the National Congress the completion or enlargement of existing projects.

CHARLES H. PAUL ASSUMES ADDED RESPONSIBILITIES.

Charles H. Paul, who has been serving as Assistant Chief Engineer of the Miami Conservancy District, Dayton, Ohio, has been elected Chief Engineer by the Board of Directors to succeed Arthur E. Morgan, who has been Chief Engineer since the inception of the work, and who has relinquished his position for the purpose of devoting practically all of his time to the work as president of Antioch College.

Mr. Paul was connected with the Reclamation Service for a number of years on the Lower Yellowstone, Minidoka, and Boise projects, his last and most important position under the Service being that of Construction Engineer of the Arrowrock Dam.

F. L. Cavis, former Chief Accountant of the Reclamation Service, is associated with Mr. Paul as Chief Accountant of the Miami Conservancy District. A recent announcement states that Mr. Cavis has accepted a position on the teaching staff of Antioch College.

BUREAU OF THE BUDGET.**Digest of Orders and Circulars.**

Circular No. 18, August 17, 1921.—Construes Executive order of August 27, 1919, as imposing upon the General Supply Committee duty of searching for articles needed by departments where there is reason to believe that such articles can be spared by another department. Amends Budget Circular No. 7, making necessary to send inquiries only to General Supply Committee. Amends Budget Circular No. 13, eliminating necessity of referring requirements where total amount involved does not exceed \$100 and where good business judgment dictates that transfer is not economical.

Circular No. 19, August 17, 1921.—Director of the Budget will not view with favor any salary increases or perfunctory enlargement of clerical forces. In preparing estimates for 1923 all possible economies relative to purchase and handling equipment and supplies, use of office space, limitation of printing, or any activities not absolutely necessary, should receive careful attention.

Circular No. 20, August 16, 1921.—Whenever one department receives from another department under a law of general application, material, equipment, lands, etc., which the law permits to be transferred without funds, an amount equal to the value of the properties transferred should be set aside by the receiving department in its "General reserve." (See Order No. 4, July 1, 1921.) When supplies are transferred from one department to another, they are to be used directly by department receiving them, unless otherwise specified by law.

Circular No. 21, August 16, 1921.—Makes head of each department or establishment responsible for distribution within his department of Executive orders received from Bureau of the Budget.

Circular No. 22, August 18, 1921.—The jurisdiction, control, and custody of Government-owned property, vested by law in Secretary of the Treasury (30 Stat., 614), is extended to cover all rented premises outside District of Columbia and military reservations, except those specifically designated by law. Authority delegated to Secretary of the Treasury to be exercised through Supervising Architect. Secretary of the Treasury shall designate an official, with sufficient personnel, as Surveyor General of Real Estate, who will act under general direction of Chief Coordinator General Supply. The duties of the Surveyor General of Real Estate will be to collect all necessary information pertaining to owned or leased real estate of whatsoever character or wheresoever situated, and to determine what changes should be made in interest of general Government. The Surveyor General of Real Estate shall be assisted by area coordinators in collection of information, etc., and heads of departments shall furnish such information as he requests. He shall have power to assign and reassign to Federal officers and employees, in his discretion, offices and rooms in Federal buildings, but no such action will be taken until after conference with head of department. The Surveyor General shall have authority, subject to approval of Secretary of the Treasury, to abrogate or terminate existing leases by negotiation, or notice, or other action thereunder. No leases of premises for Government uses for a period longer than one year, or for an annual rental of more than \$500, shall be made except upon approval of Surveyor General of Real Estate and Secretary of the Treasury. The Secretaries of War

and Navy shall supply Surveyor General of Real Estate with general information regarding Government-owned and leased property on Government reservations, for use in economic adjustment and concentration of Government depots and housing facilities. It is not intended that the Surveyor General interfere with allocation by heads of departments of their real estate for purpose of other departmental use, but to advise heads of departments and establishments of improvements suggested by records of his office.

Circular No. 23, August 18, 1921.—It is manifestly to the best interests of the general Government at present to supply one department as far as possible from stocks of another department although articles so furnished have not been declared surplus, since some stocks are still abnormal and have not been adjusted to present conditions, irrespective of any apparent situations as to declared surpluses. Requests should be made on General Supply Committee and Chief Coordinator to take steps with view to having desired articles made available.

Circular No. 24, August 22, 1921.—Director of the Budget should be furnished each month not later than the 15th a statement of total actual disbursement for preceding month, also statement of additions, if any, to "General reserve" or savings as defined in paragraphs 2 and 3 of first Budget regulations (Bureau of the Budget Circular dated July 1, 1921).

Circular No. 25, August 25, 1921.—Federal Purchasing Board. There shall be organized in General Supply Committee a directorate of purchases to be known as the Federal Purchasing Board, to be composed of one representative from each department having authority to purchase supplies. The board will have assigned to it all questions of purchase of the several departments and establishments represented on it. While the power to purchase and coordinate purchases is centralized in the board it shall be its policy to decentralize administration matters and actual execution of purchase. Such articles as are needed in common by all departments will be allocated by board to proper department best fitted, in its opinion, to perform that particular function for whole Government service. Board will endeavor to standardize requirements so that joint purchasing may be the rule. It shall be duty of board to formulate plans and policies designed to knit purchasing activities of the several departments into a Federal business association and bring about business methods such as will effectively safeguard interests of the Government service and promote confidence of private business interests in dealing with the Government. The Chief Coordinator, who will act as chairman, will be responsible for efficiency of board.

Circular No. 26, August 25, 1921.—Federal Liquidation Board: There shall be organized in the General Supply Committee a directorate of sales to be known as the Federal Liquidation Board, to be composed of one representative from each department having sales activities. Its duties shall be to formulate plans and policies designed to knit sales activities of the several Government departments concerned in liquidation of stocks into an association and bring about business methods such as will effectively safeguard the Government's interests and to promote confidence of private business interests in doing business with the Government. The Chief Coordinator will be responsible for efficiency of the board.

Circular No. 27, August 25, 1921.—The efficient and economical management of the Government Printing Office requires that orders, so far as possible, be executed in order of receipt. Disarrangement of this plan by putting through orders for rush work results in extra expense, otherwise unnecessary, amounting to over \$300,000 annually. Orders for rush work, therefore, should be held down to a minimum and should receive approval of department representative of Permanent Conference on Printing before being executed.

AUGUST WEATHER IN THE WESTERN STATES.

By P. C. Day, United States Weather Bureau.

The weather of August, 1921, in the Western States showed considerable variety, yet over the greater portion of the area the temperature exceeded the average of other years and the rainfall was less. The early portion of the month was mainly warm over the North Pacific States and the southern plains, but mainly cool in middle and northern districts near and to eastward of the Rocky Mountains. The middle portion of the month was mainly cool in Colorado, the middle plateau region, and the interior of California, but notably warm in the southern plains and mainly warm in Montana and northern Wyoming, while up to the 15th it was warm in Idaho, Oregon, and Washington. The final week of the month was nearly everywhere warmer than normal, and temperatures were especially high over the Plains States and the more northern Rocky Mountain States. The average temperature of the month was within a few degrees of normal throughout the West, but the excess was usually from 2° to 4° over the southern plains, also over Montana, Idaho, and eastern Washington; while a deficiency of like amount occurred over Arizona, western Colorado, and northern interior California.

Early in the month and again just before the middle there were important rains over many portions of the plains and southern plateau regions; while during the latter half of the month there were rather well-distributed rains over the southern plateau and some notable showers in portions of the Texas Panhandle, Colorado, Washington, and northern Idaho. The month's rainfall was well above normal in most parts of Colorado and Arizona, also in the Texas Panhandle and northern New Mexico, and the southern parts of Utah and Nevada; and it was somewhat above normal over most of Washington. The southern portions of New Mexico and Texas had marked shortages, also the western halves of the Dakotas and most parts of Montana and Wyoming.

The weather conditions were mainly favorable for outdoor work and for live stock, but in a few districts, especially in the southern plains, the dryness was very harmful to stock, and hindered fall plowing.

RECLAMATION SERVICE LIBRARIES.

In "Special Libraries" for June, 1921, there has been published a list of libraries in the District of Columbia both Federal Government and educational and commercial. The two libraries in the Washington office of the Reclamation Service are given in this list as follows:

"Reclamation Service, Engineering Library, rooms 6318-6322, Interior Building, Nineteenth and F Streets. Phone, Main 1880, Branch 591. Engineer in charge, Charles A. Bissell. Irrigation, hydraulics, and water power. 3,500 volumes.

"Reclamation Service, Law Library, rooms 6334 and 6336, Interior Building, Nineteenth and F Streets. Phone, Main 1880, Branch 585. Librarian, Thomas P. Jordan. Law books, United States, Federal and State reports. 2,000 volumes."

NEW EDITION HYDRAULIC AND EXCAVATION TABLES.

The fifth edition of the Hydraulic and Excavation Tables, issued by the United States Reclamation Service, is just from the press.

The first edition of the Tables was issued by the Service in 1905. Later revised editions were issued in 1909, 1913, and 1917. Compiled in the first instance with a view to the requirements of the engineers of the Reclamation Service, the book has had a considerable circulation among other engineers engaged in similar lines of work. Most of the tables have been computed especially for this publication and are available nowhere else in print. In order to make the series complete a few tables taken from other sources have been included, most of which have been extended or modified to conform to the conditions encountered on reclamation projects.

In the present edition new tables of functions of circular and horseshoe conduit sections running partially filled have been inserted, with tables giving velocity heads and discharges at critical depths. A table from which discharge of concrete pipe may be computed using the formula and coefficients recently developed by Fred C. Scobey is also inserted.

The total number of copies printed of this handbook to date is 5,000, and the large number of requests continually being received not only from our own engineers but also from engineers not connected with the Reclamation Service testify to the practical value of the work.

The book is published primarily for official use of the engineers of the United States Reclamation Service. Copies may be obtained by the public for \$1.50 each. Address the Director, United States Reclamation Service, Washington, D. C.

MONTHLY PROGRESS REPORTS FOR AUGUST, 1921.

Monthly conditions of principal Reclamation Service reservoirs for August, 1921.

(Elevation above sea level.)

State and project.	Reservoir.	Available capacity in acre-feet.	Elevation.		Storage in acre-feet.			Out-flow in acre-feet.	Elevation of water surface.		
			Spill-way crest. ¹	Lowest gate sill. ²	Beginning of month.	End of month.	Maximum.		Beginning of month.	End of month.	Maximum.
Arizona, Salt River.....	Roosevelt ³	41,305,000	2128	1903	523,153	722,544	722,544	.....	2065.78	2083.81	2083.81
California, Orland.....	East Park.....	51,000	1199.68	1111.68	32,550	19,560	32,850	12,307	1188.72	1177.15	1188.72
Idaho:											
Boise.....	Arrowrock.....	280,000	3211	2956	208,250	86,000	208,250	177,904	3185.7	3124	3185.7
	Deer Flat.....	177,000	2518	2488	85,329	44,390	85,329	50,954	2506.9	2500.25	2506.9
Minidoka.....	Lake Wolcott.....	95,180	4245	4236	98,800	101,330	106,630	293,907	4245.3	4245.51	4245.95
	Jackson Lake.....	847,000	6769	6730	472,700	173,580	472,700	365,580	6753.53	6739.54	6753.53
Montana:											
Milk River.....	Nelson.....	27,000	2214	2200	22,700	25,300	25,300	1,230	2210.96	2211.9	2211.9
St. Mary Storage.....	Sherburne.....	66,000	4788	4720	32,000	30,400	32,000	1,600	4863.2	4862.1	4863.2
Sun River.....	Willow Creek.....	16,700	4130	4085	10,339	7,215	10,339	2,830	4122.9	4118.3	4122.9
Nebraska-Wyoming, North Platte.	Pathfinder.....	1,070,000	5852	5670	929,192	.....	.....	.....	5845.42	.....	.....
	Lake Alice.....	11,400	4182	4159	5,230	.....	.....	.....	4172.7	.....	.....
	Lake Minatare.....	60,700	4125	4074	38,486	.....	.....	.....	4113.7	.....	.....
Nevada, Newlands.....	Lake Tahoe.....	120,000	6230	6224	.....	.....	.....	27,970	6226.52	6225.93	6226.52
	Lahontan.....	290,000	4162	4060	220,100	173,720	220,100	49,154	4156.1	4149.8	4156.1
New Mexico:											
Carlsbad.....	McMillan.....	45,000	3267.7	3241.6	42,500	43,000	45,000	67,000	3267.4	3267.4	3267.7
Rio Grande.....	Elephant Butte.....	2,638,800	4407	4231.5	2,059,175	2,080,518	2,098,302	123,526	4391.4	4392	4392.5
Oregon, Umatilla.....	Cold Spring.....	50,000	621.5	560	21,750	7,625	21,750	13,227	598.87	581.18	598.87
Oregon-California, Klamath.	Clear Lake.....	462,000	4540	4514	372,000	357,000	372,000	.....	4536.54	4535.96	4536.54
South Dakota, Belle Fourche	Belle Fourche.....	203,000	2975	2920	118,040	91,960	118,040	28,085	2962.7	2958.3	2962.7
Utah, Strawberry Valley.....	Strawberry.....	250,000	7558	7514	240,600	226,200	261,520	14,400	7556.7	7554.7	7559.6
Washington:											
Okanogan.....	Conconully.....	14,400	2290	2232	6,475	2,875	6,475	5,035	2270.5	2258.5	2270.5
Yakima.....	Bumping Lake.....	34,000	3426	3389	38,875	27,220	38,875	11,655	3429.8	3420.3	3429.8
	Lake Cle Elum.....	22,800	2134	2122	26,175	13,335	26,175	12,840	2134.9	2129.1	2134.9
	Lake Kachess.....	210,000	2258	2192	235,135	168,375	235,135	66,760	2261.1	2245.6	2261.1
	Lake Keechelus.....	152,000	2515	2425	121,125	50,575	121,125	70,550	2501.8	2463.2	2501.8
Wyoming, Shoshone.....	Shoshone.....	456,600	5360	5132.3	457,937	431,688	457,937	56,337	5360.2	5356.2	5360.2

¹ Or maximum storage.² Or zero storage.³ Zero water depth at elevation 1902.2.⁴ Amount of silt shown by silt survey deducted from original capacity.⁵ Proposed regulation.⁶ Estimated low-water limit under proposed plan of regulation.⁷ Vested power draft.⁸ Elevation of reservoir raised 12 inches by stop logs in spillway.

SALT RIVER PROJECT, ARIZONA.

Operation and maintenance of irrigation system.—

Water was run in all of the canals until August 19. At that time considerable rainfall caused the Cave Creek flood to come down with about 6,000 second-feet of water, breaking the Arizona Canal in nine places between Laterals 12½ and 14½. About 11 a. m. on the morning of the 21st Cave Creek again came down with about 25,000 second-feet, breaking the south bank of the Arizona Canal in nine additional places. This water continued due south from Lateral 13 of the Arizona, crossing the Grand, Maricopa, and Salt Canals without any serious damage to them. The water flooded the west end of Phoenix and continued in a southwesterly direction to the Salt River. The State capitol suffered considerable damage as water was approximately 2 feet in depth on the first floor.

Five regular maintenance crews were in the field during August, and the following statement shows the average number of men and stock employed and the results accomplished: Average number of men, 236; average head of stock, 114; miles main canals cleaned, 67½; miles laterals cleaned, 310½; linear feet stake and brush bank built, 2,401; old structures repaired, 122; cubic yards earth fill placed, 2,417; cubic yards concrete placed, 11; cubic yards sand excavated, 23,410.

The above table includes work done in the month of August in connection with the Cave Creek flood. The

maintenance crew working on the Western Canal and the one working on the laterals of the Arizona Canal were sent immediately to the largest breaks between Laterals 12 and 15 on the Arizona Canal and up to the close of August had completed approximately 75 per cent of the work necessary to put the canals in their former shape. Two hundred and fifty men and approximately 400 head of stock were used during the last five days of August on the flood repair work.

In addition to the above maintenance work, one regular construction crew, with an average of 54 men and 43 head of stock, completed the following work: New structures installed, 20; miles waste ditch constructed, 8½; miles new irrigation ditch, ½; feet of corrugated-iron pipe installed, 922; feet of concrete pipe installed, 42.

The Ruth dredger with a daily average of 3½ men and 4 head of stock bermed 9¼ miles of the Western Canal.

Work was continued on widening the Eastern Canal. The Monihan 2-yard machine with a daily average of 4½ men excavated 6,029 cubic yards of cemented gravel.

The Lidgerwood 1½-yard machine with a daily average of 5½ men excavated 9,875 cubic yards of ditch.

Operation of power system.—The total power generated during the month was 5,253,400 kilowatt hours. The Roosevelt plant operated 99 per cent of the time, generating 2,465,000 kilowatt hours. The Cross Cut plant operated continuously and generated 1,654,950

kilowatt hours. The Arizona Falls plant operated 60 per cent of the month, being shut down when water was out of the Arizona Canal. This plant generated 197,800 kilowatt hours. The South Consolidated plant operated 98.7 per cent with an output of 535,800 kilowatt hours, and the Chandler plant operated 98.7 per cent, generating 399,850 kilowatt hours.

Construction work.—At the Evergreen waste gates on the Arizona Canal the gate-operating mechanism for one gate was rebuilt, the design of the thrust bearings being changed with simple sliding, self-aligning thrust surfaces instead of specially designed ball thrust bearings which were broken.

A new cup leather was installed on the hydraulic cylinder of the north side Granite Reef gate-operating equipment. Repairs were also made on the anchorage of the operating chains of the main sluice gates at same place.

The gate-operating mechanism at the Indian Bend waste gates on the Arizona Canal was overhauled, cleaned, oiled, and put in first-class operating condition. The gas engine was thoroughly cleaned and adjusted.—*C. C. Cragin.*

YUMA PROJECT, ARIZONA-CALIFORNIA.

Rains on August 22, 23, and 29 caused some damage to alfalfa seed, though fortunately a large part of the crop had already been thrashed. The total rainfall on the 23d was 1.37 inches, of which 0.79 inch fell in 27 minutes. A small amount of cotton had been picked.

Construction.—On the South Drain the Bucyrus 30-B began work on August 8 and advanced 2,100 feet, excavating 6,700 cubic yards of class 1 material.

Operation and maintenance.—The reconstruction of the levee at the 17-mile post was completed. The P. & H. dragline began cleaning the Main Drain on the 18th and cleaned 2 miles of drain south of Fourteenth Street, excavating 2,500 cubic yards of material. On the Reservation Division, Ruth dredger No. 6 cleaned 6 miles of laterals, excavating 5,200 cubic yards of silt; on the Valley Division, 3 Ruth dredges cleaned 9½ miles of laterals, excavating 13,000 cubic yards of silt. Thirteen thousand five hundred acre-feet of water were delivered to users.

The maximum discharge of the Colorado River was 61,300 second-feet; minimum, 17,500 second-feet; total discharge for the month, 2,162,000 acre-feet. On August 31 the gage height was 22.9, with a discharge of 56,000 second-feet.—*R. M. Priest.*

YUMA MESA DIVISION.

Working conditions were not so favorable during August owing to the hot weather.

The crushing plant at the Mesa quarry was operated almost continuously by a small force of men. The rock was used in surfacing roads and for concrete at the B Lift pumping plant.

Work on the pipe-manufacturing plant was temporarily discontinued about the 1st. The erecting force was transferred to the pump plant.

The concrete for the main building of the B Lift pumping plant was practically all poured, and 150 feet of the 72-inch force main and the floor of the wasteway were also poured. The steel manifolds and traveling crane were put in place.

Office engineering was confined to routine work for present and future construction.

Labor was scarce the first part of the month, but sufficient the latter part.—*R. M. Priest.*

ORLAND PROJECT, CALIFORNIA.

Temperatures for August were moderate. The fourth crop of alfalfa was harvested and resulted in a good yield. Milo continued to make a good growth with favorable indications for a heavy crop. The gathering of the almond crop was begun early in the month but only partially completed at its close. A good yield was reported. Little water was available from the natural flow of Stony Creek, and project requirements were met by draft from storage at East Park, which amounted to 12,300 acre-feet. Approximately 14,200 acres were irrigated, to which 8,100 acre-feet of water were delivered.

An average force of three men was engaged in mowing weeds and water grass on the distribution system. A force consisting of three teams and four men began work August 29 on cleaning and repairing the East Park Feed Canal. The only construction work in progress consisted of the delivery of 130 cubic yards of gravel for use on concrete lining to be placed in the fall.

Secretary Fall, accompanied by Director Davis and others, was at Orland on August 19 for a tour over the project.—*R. C. E. Weber.*

GRAND VALLEY PROJECT, COLORADO.

The rainfall in the valley during August broke all records, with 3.65 inches at the Grand Junction station and probably much more on parts of the project. Cloudbursts which occurred in the night of August 23 on the desert northwest of Grand Junction caused all arroyos and watercourses to run out of their banks. Most of the cross-drainage structures under the project main canal from the Indian Wash to Little Salt Wash were taxed beyond their capacity and surface water entering the canal raised the water level to the top of the banks. Only one break occurred in the lower bank of the canal, at Station 1216, and no structures were seriously damaged. Repairs were started at once and water service will be restored about September 6.

The total damage to the project will not exceed \$3,000. The private irrigation systems in the valley, however, did not fare so well, and many flumes and other structures on the old Grand Valley Canal were washed out, with an estimated loss of \$30,000. Damage to county roads and bridges is estimated at \$50,000.

The project irrigation system was operated continuously until interrupted by the break on the 24th, and thereafter deliveries were made only to the Mesa County and Palisade Irrigation Districts. Maintenance work during the fore part of the month was confined to routine repair work. After the break the entire available force was used in repairs at this point. The P. & H. dragline was moved to this work and used in excavating a new channel around the damaged section of the canal.

The heavy rains were beneficial to all crops except the second cutting of alfalfa, most of which was in the shock when rains fell early in the month. Sugar beets made an excellent growth and will produce the best crop in the history of the project. The harvesting of early potatoes was completed. The price was unsatisfactory at first, but later increased to \$1.75 per hundredweight, and the growers who held their crops were well pleased with the returns. The Elberta peach harvest in the Palisade district began on the 20th and was nearly completed at the end of the month. About 800 cars were shipped. Prices were fairly satisfactory, but were lower than last

year, boxes bringing from 75 cents to \$1 and bushel baskets from \$1.50 to \$2.

Drainage construction during the month was confined to work on Drain E-4, which is the last job to be completed in the Grand Valley Drainage District. This work was delayed waiting for repair parts to the dragline and only 2,000 lineal feet of drain were completed.—*S. O. Harper.*

UNCOMPAGHRE PROJECT, COLORADO.

Weather conditions during August were about normal. Rainfall occurred at the Montrose station on 13 days during the month, which brought the total precipitation up to 1.85 inches. This rainfall is the heaviest that has occurred since August, 1914.

The crop situation was about normal at the end of the month. Practically all the grain crops have been harvested. The digging of early potatoes was discontinued on account of drop in price.

On account of the numerous rains that were general over the entire project, much of the second cutting of hay has been damaged, and some damage has also been caused to wheat in the shock.

The run-off from the Gunnison Tunnel plus the natural flow of the Uncompahgre River was sufficient to furnish a full head in all project canals and laterals during the early part of the month. During the latter part of the month the canals were drawing about 50 per cent on an average of their normal capacity, due to the heavy rains and the lack of demand for water on account of farming operations.

Several small floods occurred in a number of creeks and dry arroyos over the project, and in some cases it was necessary to do considerable protective work in order to prevent damage to the flume crossings over such creeks.

The flashboards of the Gunnison River dam were raised on August 18 in order to permit the drawing of a full head through the Gunnison Tunnel from the Gunnison River.

The P. & H. dragline was moved to the Ironstone Canal during the early part of the month and some cleaning work was accomplished on the Ironstone slide near Mile Post 1. The dragline was then moved to the headworks of the Ironstone Canal and was engaged for a period of 40 hours in removing gravel deposits from the canal that had been washed in during the June flood. This work was accomplished by operating the dragline continuously on a basis of five shifts of eight hours each.

The usual maintenance work required at this time of the year on the drain trenches at the Montrose & Delta Canal slides near Happy Canyon was begun.—*L. J. Foster.*

BOISE PROJECT, IDAHO.

Warm clear days prevailed during August. The total precipitation was 0.34 inch, which occurred on the 1st in a storm of 30 minutes' duration.

Labor conditions.—The harvest field furnished employment for a large number of men. The supply, however, was greater than the demand. There was no change in the wage scale.

Farming operations.—Thrashing was in full swing, and grain coming in to the buyers. The price of wheat ranged from 75 to 80 cents per bushel. There appeared to be no market for oats or barley. The third crop of alfalfa was well advanced. All crops of hay went into the stack in excellent shape. The digging of early potatoes was well along. The price

paid at the beginning of the month was 90 cents to \$1 per hundredweight. There was a sudden rise to \$2.35 per hundredweight early in the month. The price gradually declined to \$1.50 the last of the month. Prune picking began during the last few days of August.

Water supply.—The discharge of Boise River decreased from 1,250 to 630 second-feet. The total discharge was below normal. There was ample storage in Arrowrock and Deer Flat Reservoirs for the remainder of the season.

Operation and maintenance.—The demand for water was heavy until August 20, and gradually declined after that date. The entire canal system was in operation.

Drainage.—The 1-yard dragline excavator completed the Laht Drain early in the month. After it was thoroughly overhauled it was moved a distance of 7 miles to the Helleyr Drain, where it began operations late in the month.

Surveys.—Surveys for the deduction of seeped land areas were made during the month. The field work was completed on the Owyhee project investigations which are being conducted in connection with the State of Oregon.

Visitors.—Mr. Takayoshi Homma, chief hydraulic engineer for the Korean Government, visited the project on the 15th.—*J. B. Bond.*

KING HILL PROJECT, IDAHO.

The weather during August was favorable for construction work.

Construction.—The construction of the Cold Springs Flume was rushed during the month. A force of about 170 men and 60 horses was employed and at the end of the month the work was about 90 per cent complete.

The lower half of the Slick Flume was removed and grading for the bench started on the 18th. It is expected that concreting will commence early in September.

Engineering.—One field party was employed in camp on the construction work.

The delivery of water was uninterrupted during the month. The maximum amount diverted was 225 second-feet and the minimum 192 second-feet. Some difficulty was experienced with moss breaking loose and collecting in turnouts and at siphon intakes. Water was turned off below the Slick Siphon on August 17 to permit tearing out the timber flume below this point preparatory to replacing it with a concrete flume.

One field party was engaged in continuing the field examination of irrigated areas.

Labor was plentiful but the turnover was large.—*Walter Ward.*

MINIDOKA PROJECT, IDAHO.

August was characterized by unusually heavy rainfall, the total precipitation being 2.3 inches, which exceeds all previous records for August. In spite of this, however, there was a heavy demand for water during almost the entire month. The average flow of the Main North Side Canal was 1,417 second-feet, varying from a maximum of approximately 1,500 at the beginning of the month to a minimum of 1,321 second-feet at the end. The flow in the South Side Canal was 1,088 second-feet, its maximum, on the 1st; fell to 835 second-feet on the 20th, rose to 994 on the 27th, and then declined rapidly to 824 second-feet on

the 31st. The average for the month was 962 second-feet.

Operation and maintenance was mostly of a routine character. Considerable trouble, however, was caused by weeds blowing into the J Canal. This canal became so clogged with weeds at times as to check the flow of water very materially.

All pumping stations were operated continuously and practically at maximum capacity. The total amount of water pumped was 45,138 acre-feet.

At the power house the total power generated was 5,425,700 kilowatt-hours. In August, 1920, the corresponding amount was 5,473,920 kilowatt-hours; the maximum load, 8,020 kilowatts; and average, 7,300, with load factor of 91 per cent. There was very little interruption to service during the month.

The enlargement and rearrangement of the Rupert substation was completed.

The Boise power plant was operated throughout the month. Power was obtained from this plant for use on the Minidoka project except for five days, when repairs were being made to the Shoshone Falls plant of the Idaho Power Co., over whose wires the power is transmitted.

The delivery of stored water from Jackson Lake was continuous during the month, but decreased from 9,200 second-feet on the 1st to 2,050 second-feet on the 31st. The water remaining in the reservoir at that time was 173,560 acre-feet. Stored water was used exclusively on the project, the total amount diverted being 146,000 acre-feet.

The work at American Falls consisted mainly in the appraisal of lands in the Fort Hall Indian Reservation and in making surveys for the new town site. One party was employed half the month staking out street intersections. A survey was also made of right of way at the west end of the proposed dam.

Fourteen purchases of right of way were made at a cost of \$24,835, and two contracts were approved amounting to \$6,565. At the end of the month 86 purchases had been made at a cost of \$234,921 and 103 contracts had been approved amounting to \$264,883.

On the North Side Pumping Division topographic surveys were made covering 300 acres, making the total 151,590 acres. This left approximately 2,800 acres to be completed in the Acequia extension.

Good progress was made in the work on the Mountain Home project. One party ran 35 miles of levels, making the total 72 miles, and completing this feature of the survey. Another party was engaged in chaining out a base line and establishing a system of triangulation for a distance of 22 miles. This feature was also completed. Topographic surveys were made covering 4,130 acres. The work in connection with this survey was 21.5 per cent completed.

Shipments of farm products amounted to 53 cars, which included 12 of alfalfa and alfalfa meal, 1 of wheat, 21 of flour, 5 of hogs, 1 of sheep, 12 of sugar, and 1 of wool. Hay was quoted at \$7 to \$9 per ton baled; wheat, \$1.25 per hundredweight; and barley and oats, each 85 cents per hundredweight. The month was notable for the high prices offered for potatoes. These ranged from \$1 to \$1.50 per hundredweight for fall delivery and \$1.60 to \$1.80 for immediate delivery. It is reported that large quantities were contracted at these figures. Of the fields harvested the yield and quality were excellent. The second cutting of hay was completed and wheat thrashing was well under way. Very good wheat yields were reported, although there was some damage by rust.

Owing to the attempts to regulate the flow in some of the canals below the Minidoka project the flow in Snake River at Howells Ferry was quite variable. It ranged from a maximum of 6,150 second-feet on the 16th to a minimum of 2,554 second-feet on the 13th. The total discharge for the month was 293,907 acre-feet, nearly 80,000 acre-feet less than during July.

J. L. Burkholder, drainage engineer, visited the project on the 22d and 23d in connection with drainage matters both on the gravity and pumping divisions.—*Barry Dibble.*

Prevailing crop prices at close of August, 1921.

Project.	Alfalfa hay, per ton.		Barley, per bushel.	Oats, per bushel.	Wheat, per bushel.	Potatoes, per bushel.
	In stack.	Baled at shipping point.				
Salt River.....	\$6-\$8	\$10-\$11	\$0.63	\$0.53	\$1.30	.....
Yuma.....	6.50	11.00	.40	.....	1.15	.....
Orland.....	6.50	9.50	.58	.....	.80	.....
Grand Valley.....	8.00	12.00	.....	.70	.75	\$1.00
Uncompahgre.....	6-8	.....	.50	.34	.93	.96
Boise.....	4.00	8.00	.35	.45	.78	1.20
King Hill.....	5.00	.....	.....	.42	1.25	1.10
Minidoka.....	.....	9.00	.43	.28	.75	1.08
Huntley.....	8.00	.....	.....	.....	1.00	1.25
Milk River.....	5.00	.....	.52	.37	1.09	1.20
Sun River.....	6.00	10.00	.70	.70	1.10	1.20
Lower Yellowstone.....	6.00	.....	.30	.25	1.15	1.20
North Platte.....	.....	10.00	.....	.....	.85	.75
Newlands.....	6.00	.....	8-10	.....	1.20	.....
Carsbad.....	.....	7-14	.....	.....	1.26	.....
Rio Grande.....	.....	.....	.....	.....	.....	.....
North Dakota pump- ing.....	15.00	18.00	.....	.43	1.09	2.00
Unatilla.....	11.00	.....	.....	.....	.85	.....
Klamath.....	8.00	14.00	.44	.35	.90	.....
Belle Fourche.....	7.00	10.00	.40	.35	1.00	1.20
Strawberry Valley.....	.....	13.00	.58	.45	.90	.90
Okanogan.....	18.00	.....	.....	.....	.....	1.20
Yakima:	.....	.....	.....	.....	.....	.....
Sunnyside.....	6.00	9-11	.....	.....	.....	.90
Tieton.....	6.00	9-11	.....	.....	.....	.90
Riverton.....	.....	.....	.....	.40	.70	1.20
Shoshone.....	.....	.....	.75	.....	.91	.....
Indian projects:	.....	.....	.....	.....	.....	.....
Blackfoot.....	10.00	.....	.23	.75	1.03	.....
Flathead.....	10.00	15.00	.....	.....	.99	1.05
Fort Peck.....	.....	.....	.....	.11	1.19	1.50

HUNTLEY PROJECT, MONTANA.

August weather was a continuation of the hot, dry condition which prevailed throughout the latter part of June and all of July. The lack of precipitation necessitated heavy and continuous irrigation. The auxiliary pumping plant was not operated at any time during the month, the hydraulic station being able to supply the demand at all times. The Yellowstone River reached a very low stage during the month, with a maximum diversion of approximately 350 second-feet, which corresponds closely with the low record of 340 second-feet in 1919.

Operation and maintenance work was light. The Ruth dredger was placed in operation on the 12th on Lateral B and cleaned this lateral for its entire length by September 1.

The Austin dragline completed a small cut-off on Arrow Creek and was moved to Drain 18 and completed 1,200 feet of open ditch by the end of the month.

Farming operations were being conducted on the alkaline area near Newton, and approximately 40

acres had been seeded to winter wheat and 40 acres prepared for seeding to rye; it is proposed to plow and level 50 acres additional land for spring seeding.

Grain harvest was nearly completed, some stack thrashing remaining to be done. Beets made a rapid growth during the month and a good yield was generally expected.—*A. R. McGinness.*

MILK RIVER PROJECT, MONTANA.

August weather was dry, with temperature about normal; favorable for construction, operation, and maintenance work and for farming operations. The second cutting of alfalfa was completed, and in some instances a third cutting was begun. The second cutting as a rule was light. Harvesting of grain crops was completed and thrashing was unusually well along, with wheat running from 8 to 20 bushels and oats from 20 to 60 bushels to the acre. The cutting of the blue-joint hay crop was approaching completion. The range deteriorated some during the month, but was still in fair condition and stock looking well. The labor supply was short.

Surveys.—Farm unit and lateral extension surveys were continued in the vicinity of Glasgow and Hinsdale. Planetable parties were engaged on topography of Beaver Creek Flats in the vicinity of Hinsdale and Ashfield. Considerable work was done in putting in test wells on Beaver Creek Flats, as well as at other points on the project, for drainage observations.

Construction by contract.—The contractor for the enlargement of Nelson Reservoir made good progress. Four small earthwork contracts were under way, of which three were completed. Two small structure contracts were also under way, of which one was completed and the other made poor progress. In addition to the above two small earthwork contracts were let, but the work was not commenced.

Construction by Government forces.—The road crew completed 21 miles of operation and maintenance road on the Vandalia Main Canal. Drainage construction by the P. & H. dragline was continued on the ND-1, located about 3 miles east of Nelson Reservoir. A considerable number of small structures, including bridges, turnouts, checks, and measuring devices, were built.

Operation and maintenance.—Canals on the Malta and Glasgow Divisions were operated intermittently for the delivery of water, and 900 acre-feet delivered to the farmers during the month. Little water was used on the Chinook Division during the month. The principal items of maintenance work included continuing cleaning of the Dodson Main North Canal (2.3 miles) with the P. & H. dragline; cleaning Dodson North Canal laterals (7 miles) with the Ruth ditch cleaner; completion of sluicing slides in the river bank at Vandalia Point and protective work on the river bank at that point and at mile 8 of the DS-50 Lateral near Wagner; also protective work on canal banks at various points, and beginning to paint the service bridge at Vandalia Diversion Dam, as well as removing willows, and other routine matters.

Dr. F. H. Newell spent considerable time on the project and in the vicinity compiling data in regard to the division of water between this country and Canada and other matters pertaining to the project.—*Geo. E. Stratton.*

ST. MARY STORAGE DIVISION.

The warm weather during August, except for local showers, was warm and dry and favorable for the operations of the service.

The water stored in Sherburne Lakes Reservoir was held nearly constant during the entire month, there being a storage of 32,000 acre-feet at the beginning of the month and 30,400 acre-feet at the end. The St. Mary Canal was operated at part capacity from the 1st to the 15th, when it was shut down for the season. A total of 8,621 acre-feet was diverted from the St. Mary River, and a total of 7,855 acre-feet to the North Fork of the Milk River.

After the canal was closed down the ditch riders were employed in cutting weeds and making minor repairs to canals and structures.

A crew consisting of an average of 1 foreman, 6 men, and 4 teams was employed in rebuilding canal bank, and the Bucyrus dragline was operated during the month removing slide material from the canal section and flattening canal slopes at Mile 12.—*R. M. Snell.*

SUN RIVER PROJECT, MONTANA.

August weather was moderately warm. Precipitation was light.

Construction work by Government forces consisted of continuing improvement of operation road along Pishkun and Sun River Slope Canals and placing structures on Lateral D extension, Fort Shaw Division. Contract work on earthwork and structures of Beale Division was continued throughout the month; schedule 4 was completed.

The Fort Shaw Canal system was operated throughout the month; the amount of water diverted into the canal varied from 210 second-feet on the 1st to about 50 second-feet at the end of the month. A heavy growth of sweet clover along the ditch banks interfered with operation of the ditches under maximum heads.

Water was delivered to the Greenfields Division from the 1st to the 8th and from the 25th to the 31st, inclusive.

Maintenance work consisted of minor repairs to a few structures and removal of silt from weir pools on the west end of the Fort Shaw Division, of removing rock and silt from Sun River Slope Canal at about Station 225, and of raising the settled part of the lower bank of Greenfields Canal at about Station 120.

Farmers harvested grain and the second crop of alfalfa and irrigated alfalfa. A small acreage was plowed. Wheat thrashing was begun on the 29th and a fair yield was being returned from fields not damaged by worms. Five cars of wheat and one of flax were shipped from the project during the month.—*Geo. O. Sanford.*

LOWER YELLOWSTONE PROJECT, MONTANA.

August was the first month since records have been kept (1906) when there was not sufficient precipitation to measure. On the upper end of the project the last rainfall was on July 3, and on the lower end of the project there had been no precipitation since July 12. Never has eastern Montana been so dry.

The irrigation of sugar beets, alfalfa, corn, and potatoes was heavy through the month. During the latter part of the month considerable stubble irrigation was carried on for fall plowing. Eighteen thousand one hundred and twenty acres were irrigated this season. Crop conditions were spotted. The grain crops have not yielded what was anticipated, owing primarily to unfavorable weather conditions, grasshoppers, and improper farming methods. Grain crops on land previously in alfalfa and row crops yielded

well. A large crop of corn and alfalfa will be harvested, and the sugar beets and potatoes promised good returns.

The Ruth ditch-cleaning machine maintained its good record established in July, and during the month of August 10,214 cubic yards of material were moved. During the month this machine traveled 19.1 miles, working on 7 miles of laterals. During the two months this machine has been operated, 8.4 miles of laterals have been cleaned.

The operating force, in addition to repairing breaks and looking after the routine maintenance work, installed the following structures: 8 concrete drops, 2 concrete checks, 3 farm turnouts, 7 corrugated road culverts, and 9 pipe culverts (in connection with lateral extensions).

Construction under contract, No. 864, with J. E. Hilton, under specification 399, was well under way during the latter part of the month. There were 14 subcontractors at work during the month, and 38,400 cubic yards of material was moved.

An active campaign has been started by the business men and prosperous farmers of the valley in forming an association to promote the dairying industry. It has been clearly demonstrated that grain farming is not profitable and that the landowners must practice intensive farming on small areas.—*L. H. Mitchell.*

NEWLANDS PROJECT, NEVADA.

August weather, although dry and hot, was favorable for construction and farming operations. The maximum recorded temperature of 99° F. was about the average for this month; however, the total absence of precipitation was rather unusual for this section. All crops made an excellent growth, especially alfalfa, sugar beets, and cantaloupes. The second cutting of alfalfa, which was generally harvested early in the month, was reported unusually heavy. The shipping of cantaloupes began about August 15, and by the end of the month an average of about 175 crates were being shipped per day besides supplying quite an extensive local market. As a result of the uninterrupted hot weather cantaloupes and watermelons, together with garden truck generally, were of unusually fine quality and found an eager market.

Operation and maintenance.—The routine of water delivery was uninterrupted except for a few minor breaks in the lateral system. The moss trouble, which proved such an annoyance to water delivery during July, had practically disappeared by the middle of August. The outflow from Lahontan Reservoir was fluctuated between 696 and 911 second-feet to meet irrigation demands, the total draft for the month being 49,154 acre-feet; the reservoir surface was lowered 6.30 feet. The outflow from Lake Tahoe was fluctuated between 399 and 469 second-feet in maintaining the vested Floriston power rates, there being no United States storage reserve left in this reservoir. The flow in Truckee River at Derby Diversion Dam was very low throughout the month, the diversion by Truckee Canal ranging from 143 to 250 second-feet, all of which was very carefully rotated for irrigation purposes. The Lahontan power plant was operated from the auxiliary takeout from Lahontan Reservoir throughout the month.

The principal maintenance work consisted of repairing the concrete lining in the Gilpin Spillway tunnel, which developed a serious failure, apparently as a result of vibration from the Southern Pacific Railroad, which passes overhead, and the erosion from the occasional waste water from Truckee Canal. On the project at large the usual number of lateral

breaks were repaired and several miles of laterals were cleared of grass and other vegetation.

Construction.—The Truckee Canal improvement work was carried on energetically throughout the month, Monighan drag line No. 3 being operated two shifts per day, strengthening the lower bank in the vicinity of Fernley. The small Austin drag line No. 5 was used one shift a day excavating gravel slides into the canal near Derby resulting from cloudbursts several years ago.

The project deep drainage program was prosecuted vigorously by way of moving the new drag line excavators to the scene of operations and starting actual digging. The P. & H. drag line started digging on the Lower Soda Lake Drain on August 11. Of the two big Bucyrus drag lines, one started excavation of the New River Drain on August 19 and the other began on the L Drain cut-off on August 27. Altogether approximately 2 miles of deep drain were completed during the month.

Two survey parties were in the field throughout the month running final location surveys for the project deep drainage system. A third survey party was busy most of the month on Truckee Canal improvement work and seeped and alkaline area surveys.

Miscellaneous.—The efforts of the Farm Bureau department toward organizing a State marketing association with local branches in every county has been successful, and it is expected this newly formed organization will materially assist in the marketing of hay and other farm produce hereafter.

Assistant Engineer T. A. Evans, of the Southern Pacific Railway, visited the project office on August 24 for the purpose of procuring data on irrigation development and proposed future plans of reclamation for use in a State-wide study of these matters by that company.

The project manager, in company with members of the water users' association and representatives of the Fallon Chamber of Commerce, interviewed Secretary Fall at Carson City, Nev., while on his recent visit to this State and discussed reclamation and other important matters. Later the project manager accompanied Secretary Fall to Lake Tahoe and from there to Reno, Nev., where the proposed Spanish Springs Reservoir site was inspected.—*D. S. Stuver.*

CARLSBAD PROJECT, NEW MEXICO.

August was normal, with a maximum of warm, fair weather. The total run-off of the Pecos River at the Dayton Station equaled 67,000 acre-feet. The maximum flow occurred on August 18 and amounted to 3,000 second-feet. The river was discharging 340 second-feet at the close of the month. Practically all flood waters during the period originated in the mountains around Santa Fe and Las Vegas.

The regular maintenance crew was employed during the month chopping weeds and grass from the lateral system. One man was employed all of the time and two men part time patrolling the canal banks, cutting weeds, and poisoning and trapping gophers. The regular operation force was unusually busy during the month in the delivery of the peak water demand of the season.

General crop conditions were good on the project. Yields of alfalfa were very satisfactory and the quality good. There was some improvement in the market conditions for this commodity. Prices ranged from \$8.50 to \$10 per ton f. o. b. the project. The thrashing of alfalfa seed was in progress; the average yield obtained was below normal. The cotton

crop was in thrifty condition, with promise of a large yield. The crop had begun to open in a few early fields.

There was no change in labor conditions, the average wage for farm laborers being \$1.50 per day. Labor was plentiful.

Financial conditions on the project and vicinity continued to be very bad. Range conditions, however, are good, and it is probable that there will be considerable feeding of sheep and steers on the project during the winter months. Prospects for installing an alfalfa meal mill, also a mill for crushing cotton seed, some time within the next thirty days now appear to be very good. The Federal Horticultural Board has advised all cotton gins that no cotton seed could be shipped from the project unless it had been sterilized. This will necessitate sterilizing seed at each of the gins or else the seed must be crushed on the project.—*L. E. Foster.*

Project weather during August, 1921.

Project.	Station.	Temperature, °F.			Precipitation (inches).
		Maximum.	Minimum.	Mean.	
Salt River.....	Phoenix, Ariz.....	107	70	87.1	1.62
Yuma.....	Yuma, Ariz.....	110	71	89.6	1.44
Orland.....	Orland, Calif.....	106	51	76	T.
Grand Valley.....	Grand Junction, Colo.....	95	56	73	3.65
Uncompahgre.....	Montrose, Colo.....	93	44	68	1.85
Boise.....	Boise, Idaho.....	97	52	74.1	.34
King Hill.....	Glens Ferry, Idaho.....	.....	.....	.....	.....
Minidoka.....	Burley, Idaho.....	96	43	70.2	2.3
Huntley.....	Ballantine, Mont.....	90	41	71.5	.24
Milk River.....	Malta, Mont.....	101	41	70	.42
St. Mary storage.....	Near Babb, Mont.....	85	21	57	.3
Sun River.....	Fort Shaw, Mont.....	94	35	66.4	.61
Lower Yellowstone.....	Savage, Mont.....	100	35	70	.....
North Platte.....	Wyncote, Wyo.....	.....	.....	.....	.....
Newlands.....	Fallon, Nev.....	99	44	71.9	.1
Carlsbad.....	Carlsbad, N. Mex.....	104	58	79.9	1.25
Rio Grande.....	El Paso, Tex.....	98	64	80	.35
North Dakota pump- ing.....	Williston, N. Dak.....	97	44	68	.4
Umatilla.....	Hermiston, Oreg.....	101	42	71	.18
Klamath.....	Klamath Falls, Oreg.....	96	39	65.5	.....
Belle Fourche.....	Orman, S. Dak.....	101	50	75	.35
Strawberry Valley.....	Provo, Utah.....	95	45	69.5	1.37
Okanogan.....	Omak, Wash.....	103	41	73.3	.....
Yakima.....	.....	.....	.....	.....	.....
Sunnyside.....	Sunnyside, Wash.....	100	41	70.6	.07
Tieton.....	Cowiche, Wash.....	94	42	67.7	.28
Riverton.....	Diversion Dam, Wyo.....	91	40	67.1	.28
Shoshone.....	Powell, Wyo.....	91	43	68.4	T.
Indian projects:	.....	.....	.....	.....	.....
Blackfeet.....	Browning, Mont.....	83	31	57	.23
Flathead.....	St. Ignatius, Mont.....	94	36	65.5	.08
Fort Peck.....	Poplar, Mont.....	101	50	75	.56

RIO GRANDE PROJECT, NEW MEXICO-TEXAS.

The weather for August was hotter than usual with a greater rainfall and some hail. A heavy rainstorm west of Hatch did considerable damage.

There were 41,578 acres irrigated, with a delivery of 22,273 acre-feet to 2,996 users.

At Elephant Butte Reservoir preparations for the repair of the balanced valves were being made. Inquiries are constantly being made as to a concession for a hotel, and gradually more private boats are appearing on the lake.

The only interruptions to the delivery of water during the month, with the exception of interruptions of a few hours' duration for sluicing, were on account of floods. From the 17th to the 22d water was cut out of the Rincon Valley system and from the 20th to the 23d all tap boxes were closed, checks

pulled, and sluiceways opened on the Franklin Canal, on account of flood condition at Hatch, N. Mex. Crops did not suffer on account of these cut outs. Three cuts of short duration were made at the Mesilla Dam on account of floods. Unusual rains assisted the growth of weeds on canals and drains, and flood water brought more than the usual amount of sand into the canals. No unusual difficulty was encountered, however, except on the San Miguel Lateral, which silts up considerably. The expected demand for water was increased on account of the rains mentioned. Considerable attention was given to improving the hydrographic conditions. Lack of meters prevents the maximum results.

In the Mesilla Valley weed cutting on 31 miles of the Leasburg Canal system cost approximately \$42 a mile, in the El Paso Valley weed cutting on 34 miles of lateral cost \$14.3 per mile, and 19 miles of the Mesilla Canal system approximately \$43 per mile. Five hundred and sixty-five lineal feet of brush riprap were placed on the Mesilla Canal system at 26½ cents a foot. Six hundred cubic yards of sand were removed from the San Miguel Lateral at 21½ cents a yard. Sand was removed from canals and repairs to flood damage were made in the Rincon Valley Division. The free flow in the Franklin Canal cleaned out a quantity of sediment. Government-operated canals in the El Paso Valley are in much better condition this year on account of opportune maintenance.

A Martin ditcher was being tried out with encouraging results in the El Paso Valley. It is estimated that the fall cleaning in this valley will be 50 per cent less than in 1920.

Laborers cost a maximum of \$1.60 a day and teams cost \$4 in the Mesilla Valley.

Some damage was done to crops by rain and hail. Pears from the project were being shipped as far away as England. The El Paso Valley Bartlett Pear Association closed the season with 29 carloads of pears shipped. The season's shipment of cantaloupes was approximately 650 carloads, which is considerably below the usual amount. In the El Paso Valley 127 carloads of alfalfa had been shipped. Stock on the ranges surrounding the project was in good condition. Farmers stated that the raising of calves will not pay for the milk they consume. Approximately 90 per cent of the wheat crop of the El Paso Valley had been sold locally. There was considerable local demand for truck, much of which is sold direct to the consumer.

On August 17 a cloudburst struck the mesa west of Hatch, N. Mex., and the water, running down the arroyos, settled in the hollow where the town is located, and damaged adobe buildings to the extent of several thousand dollars and crops to the extent of several thousand dollars more; \$214 had to be spent repairing canals damaged by the flood, and more will have to be spent rebuilding cuts made to drain the town. Considerable work was done by the Service to relieve the situation. This flood was felt all the way down the river, and has caused considerable activity looking toward the further control of the river, especially near El Paso, where some little silting up has taken place.

The city and Chamber of Commerce of El Paso were planning a nation-wide advertising campaign to induce substantial farmers to come to this project.

Concreting on the spillway at Elephant Butte was continued throughout the month. Other construction work on the project consisted principally of the op-

eration of dragline excavators and the construction and placing of structures. In the Mesilla Valley three draglines continued drainage construction, two working on the two-shift basis and one on a one-shift basis. One machine operated continuously on lateral and levee construction. The new Ruth ditch-cleaning machine began operations on the 15th of the month and operated on a one-shift basis; 2.2 miles of drain and 1.1 miles of lateral and levee were constructed; 1.5 miles of laterals were cleaned. In the El Paso Valley two Bucyrus excavators and a Jennings Construction & Engineering Co. contract machine continued the drainage construction while the Bucyrus 30-B continued on canal construction and the small P. & H. machine on lateral construction; 1.4 miles of drain, 0.4 mile of lateral, and 2.4 miles of the Franklin Canal banks were reconstructed.

Mr. L. T. Jessup, drainage engineer, Department of Agriculture, with offices at Yakima, Wash., visited the Rio Grande project on August 6 in company with Dean Bloodgood, of the New Mexico College of Agriculture. Mr. Jessup is interested in drainage requirements and results, types of drains, and structures used on Reclamation Service projects.—*L. M. Lawson.*

NORTH DAKOTA PUMPING PROJECT.

August was generally hot and dry and the conditions unfavorable. The precipitation was 0.40 inch, which was 0.91 below normal, reducing the excess for the year to 1.79 inches.

Owing to the heavy precipitation of June and July only limited preparation was made for irrigation. The early grain had matured by August and the late grain was so far advanced that farmers dispensed with irrigation rather than go into the tall grain with teams and ditchers. As a result, grain irrigation was practically eliminated. The demand for water in August was regular and continuous, but it now appears that the acreage actually irrigated will fall below that of 1920 by about 10 per cent.

The irrigation season closed August 19 at midnight. In addition to the pumping operations the power plant was operated for the commercial power contract; 82,900 kilowatt-hours of energy was delivered to the city of Williston. This was 6,050 kilowatt-hours more than the previous month and 1,250 kilowatt-hours less than was delivered in the same month of last year. The return was \$797.75 more than the same month of last year.

Two thousand and sixteen tons of coal were mined.—*Wm. S. Arthur.*

UMATILLA PROJECT, OREGON.

August was marked by a low rainfall, there being 0.15 inch, as against an average for the previous 13 years of 0.37 inch.

Farming operations.—Farming operations were confined principally to the irrigation of the third crop of alfalfa. At the close of the month a few had harvested their third crop, but for the most part the crop was backward. Forty-five cars of hay were shipped during the month, approximately 9 tons of honey, and 1 car of mixed stock.

Labor conditions.—There was a surplus of labor for all work in progress. When the haying season is over there will be a marked excess in the supply.

Operation and maintenance.—The Feed Canal was not operated. At the close of the month the available storage at Cold Springs Reservoir was 7,625 acre-feet, being approximately 2,000 acre-feet less than on

the same date the previous year. From 175 to 236 second-feet were diverted by Canal A and from 10 to 26 second-feet by the Maxwell Canal continuously throughout the month. The West Side Canal diverted from 110 to 120 second-feet continuously. The demand for water on the East Side was exceptionally heavy, but on the West Side the demand decreased considerably beyond expectations.

Maintenance work consisted principally of small repairs, the combatting of moss and weeds, the building of a new fishway at Three Mile Falls, involving approximately 25 cubic yards of concrete, the remodeling of spillway No. 2 on the Feed Canal, and the building of approximately 350 lineal feet of concrete sidewalk at the engineer's cottage and the project office.

Construction.—West Side Division: 332 lineal feet of 12-inch concrete pipe and 4 turnout structures were constructed on laterals Nos. 2 and 5c under supplemental construction. Fifty lineal feet of 15-inch concrete pipe, 10 lineal feet of 16 inch, and 1 concrete turnout were placed on lateral 5b under West Side original construction.

East Side Division: Approximately 42 cubic yards of concrete were placed on the Feed Canal, raising the old lining between the barrel flume and spillway No. 1, under supplemental construction; 1,678 16-inch concrete pipe, 1,410 20-inch concrete pipe, and 4 concrete turnouts were manufactured.—*Maurice D. Scroggs.*

KLAMATH PROJECT, OREGON-CALIFORNIA.

All project crops were in excellent condition and yields above the average were expected. The farmers were putting up the second cutting of alfalfa hay; the project grain crop was also being harvested. On the lower portion of the Tule Lake leased lands the grain crops promised well; on the higher lands the yield will be much lighter, owing to lack of moisture.

Four small crews were engaged on general operation and maintenance repair work and improving several of the storehouse buildings at the headquarters office. During August a total of 12,370 acre-feet of water was delivered to the farmers. Several breaks of minor importance occurred on the project canals; the longest interruption in water deliveries from this cause was two days.

One survey party was engaged all the month in field work in connection with the precast flume job on the C Canal and the structures on the C-G Canal. In the office plans were prepared for form work and the steel detailed for the structures on the C-G Canal; plans were also prepared for reconstructing the headworks and drop structure for the C Canal.

The precast work for the C Canal flume was completed on the 13th. The total length of the precast units is about 4,300 feet. The precast units consist of 990 flume sections 11 feet wide and 6 feet high; the sections are 4 feet 3 inches in length; 335 sets of stringers, 3 stringers to a set; 279 frame bents ranging in height from 5 feet 6 inches to 15 feet 6 inches, and 56 solid bents ranging from 1 to 4 feet in height. The concrete placed during the month amounted to 413 cubic yards and the total to date to 2,600 cubic yards.

Water will be turned out of the precast timber flume about September 12 and the work of dismantling the present structure and erecting the new flume will begin shortly after. A traveling stiff-leg derrick will be used for this work.

On the C-G Canal the drop structure just below the headworks has been completed, 96 cubic yards of

concrete being placed. On the Lost River structures the excavator for the pipe lines on the north side of the river has been completed and some work has been done on the cofferdams for placing the concrete pipe across the river. A part of the form work on the north side of the river has been completed and most of the reinforcing steel had been placed. Concreting will begin early in September.

On the J Canal excavator No. 122235 excavated the canal section and constructed the lower bank for a distance of about 10,000 feet, excavating about 30,000 cubic yards of material. Excavator No. 121478 began work at the upper end of the canal and at the end of the month had completed the canal for a distance of about 1,000 feet.

On the drainage system excavator No. 121248 cleaned and deepened the No. 8 and No. 9 drains and began the work of extending and deepening the No. 10 drain.

On the Lower Diversion Dam on Lost River the contractor had a crew of about 10 men at work throughout the month. Excavation had been substantially completed for the headworks and for the north half of the dam. Fair progress was made in the constructing of forms and placing of steel; concreting will begin early in September.

On the Link River Dam the California Oregon Power Co. employed a crew of about 150 men, working in two shifts. On the east side of the river the abutment and dam were completed for the 7 gates and for 13 ports. The total concrete placed amounted to about 1,400 cubic yards. The gates and hoisting devices on the east side of the river have been in-

stalled. The channel on the east side of the river, just above the dam, will be completed shortly. A crew was also at work excavating a channel through the reef where Link River leaves the lake. About 5,000 cubic yards of rock had been excavated.

On August 20 Secretary Fall, accompanied by Director Davis and others, arrived on the Klamath project for an inspection of the project.—*Herbert D. Newell.*

BELLE FOURCHE PROJECT, SOUTH DAKOTA.

August weather was extremely hot and dry. There appeared to be no shortage of labor during the month either for farming or Government work. The price for common labor remained about the same.

Construction work progressed satisfactorily. There were 48 men and 175 head of stock employed on Willow Creek Division. The total yardage completed was 90,413, or approximately 45 per cent of the work to be done under the Threet Bros. contract. There were 10 different small outfits working on this job. There is little doubt that the work will all be completed by the beginning of winter.

Owing to the continued hot, dry weather, the amount of water required for irrigation was above the average. The entire canal system was in operation throughout the month, carrying a steady, although not a maximum, flow. At the close of the month the North Canal flowed 380 second-feet and the South Canal 225 second-feet. The flow in the Belle Fourche River was sufficient to meet the requirements of the Johnston Lateral and Inlet Canal lands, with the exception of a few days near the end

Comparison between operation and maintenance estimates and results Jan. 1 to Aug. 31, 1921.

Project.	Gross cost.				Accruals.				Area which can be irrigated, in 1921.
	Estimate for 1921.		Actual cost to Aug. 31.	Amount *over or under.	Estimate for 1921.		Actual returns to Aug. 31.	Amount more or *less than estimate.	
	Total for year.	To Aug. 31.			Total for year.	To Aug. 31.			
Belle Fourche.....	\$118,500	\$90,000	\$89,700	\$300	\$148,000	\$126,000	\$126,000	0	Acres.
Boise.....	345,000	228,000	269,000	*41,000	321,500	301,000	256,000	*245,000	82,800
Carlsbad.....	50,000	36,500	37,500	*1,000	52,000	44,300	46,700	2,400	165,800
Grand Valley.....	60,000	38,000	41,000	*3,000	61,400	43,000	42,000	*1,000	25,000
Huntley.....	75,000	51,500	48,200	3,300	88,600	83,000	57,800	*25,200	38,350
King Hill.....	129,000				29,000				31,300
Klamath.....	75,000	58,000	59,700	*1,700	87,900	79,500	82,000	2,500	16,000
Lower Yellowstone.....	66,000	48,000	44,000	4,000	66,000				52,500
Milk River.....	90,000	52,000	54,000	*2,000	45,000	42,000	14,000	*28,000	38,700
Minidoka (South Side).....	134,000	88,800	83,300	5,500	134,000	115,700	103,500	*12,200	274,500
Newlands.....	118,700	87,300	84,300	3,000	120,600	102,000	104,000	2,000	49,000
North Dakota, pumping.....	59,050	46,000	36,700	9,300	26,800	26,800	26,800	0	69,300
North Platte—Interstate.....	1275,000				342,800				7,650
North Platte—Fort Laramie.....	163,000				24,000				*129,900
Okanogan.....	35,000	25,500	30,000	*4,500	41,700	37,000	40,700	3,700	14,000
Orland.....	35,000	20,400	27,000	*6,600	41,200	35,700	35,700	0	8,000
Rio Grande.....	242,500	194,000	186,000	8,000	249,000	202,000	177,000	*25,000	20,500
Shoshone.....	108,600	79,000	67,000	12,000	126,000	114,000	105,000	*9,000	118,000
Strawberry Valley.....	130,000	21,000	17,900	3,100	60,300	58,600	40,100	*18,500	65,800
Sun River—Fort Shaw.....	20,000	15,500	15,400	100	26,400	23,500	23,300	*200	59,100
Sun River—Greenfields.....	25,000	19,400	29,400	*10,000	15,000	15,000	20,400	5,400	12,200
Umatilla.....	53,000	40,200	36,500	3,700	53,000	47,000	49,000	2,000	25,100
Uncompahgre.....	145,000	99,000	113,000	*14,000	152,300	105,000	67,000	*38,000	26,300
Yakima—Sunnyside.....	135,000	91,000	93,000	*2,000	150,500	116,500	116,000	*500	100,000
Yakima—Tieton.....	92,000	58,000	60,000	*2,000	103,200	94,000	99,000	5,000	110,800
Yuma.....	233,000	173,000	200,000	*27,000	300,000	245,000	241,000	*4,000	32,000
Total.....	2,712,350	1,660,100	1,722,600	*62,500	2,866,200	2,056,600	1,873,000	*183,600	1,433,900

* Report not received from project in time for publication.

* Stored water is furnished through St. Mary Canal for 21,600 acres additional.

* Includes 17,000 acres for which water is carried in main canal.

* Does not include Strawberry Tunnel repairs.

of the month, when demands exceeded the quantity available by about 5 second-feet.

Most alfalfa fields have been irrigated three times, and will take at least one more irrigation. The cutting of the third alfalfa crop was in progress at the close of the month and a rather large per cent of it was in the stack. The crop was good where sufficient water had been used. The yield of alfalfa this year should be very good, since three full cuttings and at least a good light fourth should be harvested. Small grains have been harvested and were being thrashed during the latter part of the month. The yield on the whole was very unsatisfactory; the average for the project will probably be around 12 bushels per acre of wheat. Oats and barley were also very poor. This condition of the small-grain crop was caused by the intense heat early in June, followed by an unusual amount of hot, dry weather. The corn crop was first class, and with another two weeks of good weather will be out of danger of frost. Beets had improved considerably, and the crop will be fair.

Maintenance work was carried on from the Newell camp with a small force with Government teams working on the North Canal strengthening weak places and with a small carpenter's crew working on structure replacement and repair. This crew at the close of the month had been switched over to re-setting about three miles of telephone line. A second 36-inch corrugated iron culvert pipe was put under the North Canal Siphon and back-filled. It is believed that the two pipes now installed at this point will have sufficient capacity to take care of any storm water or canal waste that may occur without endangering the structure. The maintenance crew at Vale put in most of the month repairing and replacing worn-out structures. Replacements made were as follows: 9 wooden farm turnouts, 1 wooden drop, 2 wooden chutes totaling 140 feet in length, 1 pipe chute, 1 wooden check, and 1 wooden culvert.

A small crew with two teams engaged cutting weeds and making miscellaneous repairs to canal banks; 18 miles of banks were cleaned of weeds. At Orman the work of grouting in and repairing blocks on the face of the dam was completed and gravel hauled for small concrete structures. One carload of lumber and three carloads of tile were unloaded at Fruitdale and delivered either to the field or to the station at Orman. Ten thousand feet of lumber was dipped with creosote. The Ruth dredger was operated throughout the month in the vicinity of Newell and cleaned a total of 7.6 miles of lateral. The machine worked very satisfactorily, and from measurements taken along the canals it is estimated that it moved about 6,800 cubic yards of wet material. The drag-line excavator worked from the 8th until the close of the month on the Lewis cut-off on the South Canal, where the Belle Fourche River encroached to such a point that it seemed advisable to set the canal further back into the hill. Some of this material was very hard and had to be blasted before it could be loaded into the bucket.

During September preparations will be made for doing a certain amount of maintenance when the water is cut off at the end of the month. It is planned to reline the Indian Creek Lateral chute. The concrete chute on the Gregory Lateral will be replaced by a 24-inch vitrified sewer pipe. It is also planned to change the grade of the Indian Creek Flume and to replace certain small wooden flume linings in the Johnston Lateral with concrete linings.

Throughout the rest of the project only such work will be done as is absolutely necessary for the proper maintenance of the system. No aggressive plan of maintenance work is figured for this fall, as the system is in good shape and funds will be short.

Crops in general on the project are poor. The yield on small grains was very disappointing. The first cutting of hay was very good, but a very large per cent of it was injured by heavy rains while in the swath or windrow. The corn crop was good and potatoes and beets were fair average. It was reported that hog cholera existed in the vicinity of Newell on one of the ranches, although there appeared to be no spread of the disease. Cattle were in good condition and some herds had been driven into the project from lack of water on the range. The price of cattle, such as is raised and marketed from this project, was very low, being only 5 to 6 cents. Stock hogs had been selling at a fair price, some as high as 10 cents. Sheep were low, and lambs locally were worth only 6 or 7 cents.—B. E. Hayden.

Equipment owned and operated by the Reclamation Service June 30, 1921.¹

In connection with its widely scattered irrigation projects the Reclamation Service has a large amount of equipment, including the following:

Name.	Number.	Name.	Number.
Air compressors.....	47	Excavators:	
Automobiles:		Dragline.....	63
Passenger.....	499	Others.....	13
Trucks.....	36	Graders:	
Trailers.....	5	Elevating.....	10
Boats.....	34	Road.....	16
Boilers.....	43	Horses and mules.....	634
Cableways.....	6	Hydraulic rams.....	10
Cars:		Locomotives:	
Standard-gage.....	89	Electric.....	1
Narrow-gage.....	260	Steam.....	15
Concrete.....	44	Motor cycles.....	5
Carts:		Pile drivers.....	25
Dump.....	45	Plows.....	592
Others.....	124	Pumps.....	352
Concrete mixers.....	108	Rock crushers.....	10
Derricks:		Rollers.....	16
Stiff-leg.....	22	Scrapers:	
Guy.....	15	Fresnos.....	841
Dredges.....	7	Slip.....	1,161
Drills:		Wheel.....	335
Diamond.....	5	Sleighs and sleds.....	74
Electric.....	8	Sprinklers.....	3
Pneumatic.....	73	Steam shovels.....	12
Well.....	7	Traction engines.....	18
Electric generators.....	² 46	Wagons:	
Electric motors.....	³ 112	Dump.....	227
Electric light plants.....	23	Heavy freight.....	342
Engines:		Light freight.....	166
Gasoline.....	⁴ 152	Springs and buggies.....	109
Steam.....	⁵ 37		

¹ The estimated value of this construction equipment, including such smaller articles as shovels, mowers, rakes, etc., not listed, is \$2,393,175.

² 6,140 kilowatts.

³ 1,385 kilowatts.

⁴ 1,230 horsepower.

⁵ 892 horsepower.

STRAWBERRY VALLEY PROJECT, UTAH.

The forepart of August was generally fair and warm, the latter part cool, with numerous electrical storms.

Farming operations.—Harvesting of the grain and the second crop of alfalfa were completed and normal yields reported. The sugar-beet crop was in good condition and average yields were expected. A severe hailstorm on the 15th destroyed a portion of the

peach crop in the vicinity of Springville and Mapleton.

Hydrometric data.—The High Line Canal on the last day of the month was carrying 190 second-feet of water, and the Spanish Fork River was flowing approximately 190 second-feet. During the month a total of 19,700 acre-feet of water was delivered from Strawberry Reservoir for irrigation purposes; 11,460 acre-feet to the High Line Division, 5,680 acre-feet to the Spanish Fork Division, and 2,560 acre-feet to the Springville and Mapleton Irrigation Districts. The total amount of water delivered to the various divisions of the project from all sources was approximately 30,600 acre-feet, of which 10,900 acre-feet were delivered from Spanish Fork River.

Labor.—All classes of labor continued plentiful throughout the month.

Operation and maintenance, storage system.—The usual patrol work was done and general supervision given all structures connected with the storage works of the project by regular forces at East Portal.

Quarry operations continued throughout the month at West Portal and 110 cubic yards of rock were quarried. The crushing plant at West Portal was in operation 13 days when 106 cubic yards of sand and 109 cubic yards of aggregate were crushed and stored.

The grazing lands in Strawberry Valley improved during the month from local showers. At the end of the month there were 2,700 head of cattle, 300 head of horses, and 8,000 head of sheep on the range.

Operation and maintenance, power system.—The power plant was operated without interruption, and power furnished the towns of Spanish Fork, Payson, Salem, and Springville. The Power Canal and Spanish Fork Diversion Dam were operated without trouble and all water required for irrigation and power purposes delivered.

Settlement.—Forty-seven transfers of title were made on the books.

General.—Numerous cloudbursts in Diamond Fork Canyon during the latter part of the month washed out the bridge near milepost 6, and also covered the road in many places with landslides. Repairs to road were made by Utah County and transportation of cement and miscellaneous supplies from Diamond Switch to West Portal resumed. Altogether 48 tons were delivered by the freight contractors to West Portal.—*W. L. Whittemore.*

OKANOGAN PROJECT, WASHINGTON.

August weather was hot and dry until about the 23d. The Robinson Flat pumping plant was operated continuously and for two weeks both units of the plant were operated for a supply of additional water for this area. Pumping plants Nos. 1 and 2 were operated continuously for a supply of power to the Okanogan Valley Power Co. and for the operation of the second unit at Robinson Flat pumping plant. These two plants were closed down for the season on the last day of the month. The project distribution system was operating continuously, an interruption of one day occurring on the Upper Main Lateral owing to a break. The mechanical force was busy throughout the month in making repairs and in setting up and starting the Salmon Lake and Duck Lake pumping plants on August 25 and August 31, respectively.—*Calvin Casteel.*

YAKIMA PROJECT, WASHINGTON.

August weather was about normal. The highest temperatures of the season thus far occurred during

the fore part of the month. The mean temperature for the month was, however, somewhat below the average for the past 11 years. No precipitation occurred with the exception of a rain on the 14th.

Construction.—Work was continued throughout the month on piling and burning logs and debris at the lower end of Keechelus Reservoir with a crew of 22 to 42 men.

Operation and maintenance.—Sunnyside Division: Diversion into Sunnyside Main Canal was maintained at 1,250 second-feet up to the 23d of the month, gradually decreasing thereafter to 1,200 second-feet at the close. The average diversion for the month was 1,240 second-feet. An average of 35 second-feet was wasted in connection with pumping plant operation. Two maintenance crews were engaged in removal of weeds and moss from the canals, cleaning out turnouts, and cutting willows along the banks of Sulphur Creek wasteway.

Tieton Division: A diversion of 320 second-feet from the Tieton River was maintained throughout the month, without drawing on Clear Creek Reservoir. Demand for irrigation water was very heavy. Service on unit 3 was interrupted for about 3 hours on the 4th, while repairs were being made on flume No. 3, two of the metal sheets having opened up, allowing two to three second-feet to waste on adjoining lands. Maintenance work was confined mostly to the sublateral system, and consisted of cutting weeds and repairing minor structures. Backfilling was completed on 1,600 feet of concrete pipe on Lateral C 3.15. Plaster lining on Lateral L was in progress at the end of the month.

Storage division: Water was released from Bumping Lake Reservoir, beginning August 13, and from Keechelus, Kachess, and Cle Elum throughout the month.

New divisions: A crew of 11 men worked all month on topographic surveys for the Roza Division, covering an area of 8,310 acres.

During the visit of District Counsel Holgate, August 2 to 7, a conference was had with representatives of the Upper Scott, Basket Ford, and Powell (formerly Lower Scott and La Fortune) ditches relative to their several appropriations of water. A conference was also had with the attorney for the Kennewick Irrigation District and the interests at Prosser Dam, in connection with the suit of the Kennewick Irrigation District for condemnation of the rights and property at the dam. During the visit of Director A. P. Davis, August 7 to 9, a delegation from the Kennewick Irrigation District, accompanied by their attorney and secretary, M. M. Moulton, called to discuss ways and means for financing construction for the district.—*J. L. Lytel.*

TIETON DAM.

August weather was favorable for construction. At the end of the month the diversion tunnel headings were only 180 feet apart. The daily average during the month was 6½ feet. Corewall excavation continued with a full crew from three shafts, the excavated trench being backfilled with concrete as fast as possible. About 2,500 cubic yards of rock fill were added to the dam embankment. Work was begun on the excavation for the trash-rack structure at the upper end of outlet tunnel, and excavation was started for connecting the power flume to the tunnel at its lower end. The track was completed connecting the concrete-mixing plant with the sand and gravel plant and the latter put in operation on the 15th. The Marion shovel was excavating a road to the top of

the dam at its eastern end. The power plant operated without interruption during the month. A mercantile store building was constructed. The director and the chief engineer visited the dam from the 8th to 10th and the Secretary and party on the 30th. Average force employed, 325 men.—*C. E. Crownover.*

RIVERTON PROJECT, WYOMING.

The temperature during August was about normal for that month. The roads were in good condition throughout the month and the weather was favorable for construction. The stage of Wind River was lower than normal for August, which facilitated work on the diversion dam.

Dragline 121322 was operated two shifts throughout the month excavating from earth section of the Wyoming Canal near Mile 6½. The material was mostly a dense hard clay.

Dragline 121323 was operated two shifts on a temporary diversion channel for Wind River up to the 6th, when it was shut down on account of a break in the main frame. On the 21st it resumed operations, working two shifts, digging drain trenches and building cofferdam at the dam site, and a few days later it began excavating for the head works, sluice, and logway, practically completing the excavation for the head works by the end of the month.

Dragline 121474 was operated two shifts throughout the month on the Wyoming Canal up to the 8th, when it was moved across Wind River and took up the excavation of the temporary diversion channel; it completed this channel and a gravel dike across the river on the 20th. It then built one side of a cofferdam at the dam site, taking material from the head works site. On the 23d it resumed work on the Wyoming Canal, doing bank strengthening, and at the close of the month was building a new road from the river bottom to the top of the bench near station 290.

The total amount of material excavated from the Wyoming Canal was 38,909 cubic yards, all of which was taken from the canal prism. Of this material 26,006 cubic yards comprised class 1 material and 12,903 cubic yards class 2.

The excavation during the month for the temporary diversion of Wind River was 23,186 cubic yards, all gravel. Structure excavation at the diversion dam site amounted to 4,897 cubic yards, of which 2,660 cubic yards were class 1 material, gravel; 500 cubic yards class 2 material, shale; and 737 cubic yards class 3 material, sandstone.

Sandstone suitable for foundation was encountered at a somewhat higher elevation at the head-works site than was expected. Preparations were made for beginning the laying of concrete at the head works early in September. Equipment was received and materials and supplies were assembled in preparation for this work.—*H. D. Comstock.*

SHOSHONE PROJECT, WYOMING.

August was a pleasant month, well suited to growing and harvesting of crops. The temperatures were somewhat below normal during the first week of the month, but the average temperature for the month was slightly above normal.

Water supply.—The Shoshone River was at rather low stage the entire month. The water ceased spilling over the spillway at Shoshone Reservoir on the 3d and dropped continuously since that date, and it was necessary to draw on storage for the project water supply most of the month.

Operation and maintenance.—The principal work during the month was on the operation of the canal system; 38,638 acre-feet were diverted from the river for the irrigation of 45,000 acres; 19,921 acre-feet were delivered to the farms. Maintenance work consisted of repairing several breaks in closed drains, a small amount of canal bank riprapping, and considerable dragging of laterals to keep down the moss growth. The Austin Machinery Co. delivered a ditch-cleaning machine, which began a 30-day trial test on this kind of work on the 19th.

Crops.—The weather was favorable for the harvesting of cereal crops and the second cutting of alfalfa and for the growth of other crops. Eight cars of wheat and two cars of oats were shipped during the month.

Labor.—The labor situation continued satisfactory throughout the month.

Drainage.—The following tabulation shows the progress on drainage excavation during the month:

Machine.	Number and size of bucket.	Area.	Linear feet.	Cubic yards.	Shifts.
Bucyrus 94.....	121324, 1½-yards..	North Garland..	6,323	34,083	42
Bucyrus 95.....	11128, 1½-yards..	Frannie, part 1..	3,745	22,637	42
Bucyrus 14.....	121472, 2½-yards..	North Garland..	5,840	36,697	44
Bucyrus 14.....	121475, 2½-yards..	Frannie, part 1..	2,855	20,293	33
Lidderwood.....	113210, 1-yard....	South Garland..	3,065	10,787	38
P. & H.....	121161, ¾-yard....	North Garland..	2,377	10,574	40
P. & H.....	121153, ¾-yard....	Frannie, part 1..	Recut	4,200	26
Total.....			24,045	139,571	265

Field and office engineering.—Field work was carried on by two crews on the Garland Division the entire month and two crews on the Frannie Division from the 1st to the 20th of the month, and then one crew. One crew on each division was engaged on location of drains and structures in connection with drainage construction. One crew on the Frannie Division was engaged on topographic work for drainage and on preliminary surveys on the Pole Cat Bench extension of the Heart Mountain Canal. One crew on the Garland Division was engaged on work in connection with the location of the transmission line, principally that portion of the line from Powell to Deaver. Office work was mostly incidental to the above field work and miscellaneous work in connection with settlement.

Construction.—Construction work on the Garland and Frannie Divisions was mostly in connection with drainage. The earthwork connected with the railroad crossing of the Frannie Canal and the main line of the Chicago, Burlington & Quincy Railroad north of Frannie was done during the month and water was carried across Sage Creek in the Frannie Canal flume for the first time on the 24th of the month. Since that date some work has been done on the priming and puddling of the canal and lateral system for the lands of part 4 of that division.

At Shoshone Dam the excavation of the power house foundation and power tunnel were completed. The two lower lines of 4-inch tile for the drainage of the power tunnel were placed during the month and 90 cubic yards of concrete were placed in the floor of the tunnel; 505 cubic yards of concrete were placed in the power-house foundations and draft-tube walls; 15 feet of by-pass tunnel were excavated and the construction of the cofferdam from the upper portal of the power tunnel to the gatehouse at

the base of the dam was completed except for the placing of fine material on the outer face of the fill.

Settlement.—Several members of the Powell office force were engaged the entire month on work in connection with the opening of part 4, Frannie Division, and part 8, Garland Division, to occur September 12 to 16. Over 7,000 letters of inquiry were received and answered.—*J. S. Longwell.*

Reclamation fund transactions.

[Taken from Washington office books for the month of August, 1921.]

Balance of fund from July report.....	\$2,995,249.83
Proceeds sales of public lands (June).....	38,613.45
Proceeds oil leasing act, adjustment of erroneous credits.....	239,827.10
Deposits by special fiscal agents.....	131,688.86
Collections by auditor.....	3,288.64

Total accretions..... 2,929,013.68

Withdrawals:

Funds advanced to fiscal agents.....	663,000.00
Disbursements by auditors.....	80,496.88

Withdrawals..... 743,496.88

Balance September 1, 1921.....	2,185,516.80
Land sales, July, available in September.....	148,185.51
Land sales for August (net), estimated.....	25,000.00
Balances with fiscal agents.....	616,945.06
Royalty oil furnished Shipping Board to May 30, 1921.....	283,799.97
Royalty oil furnished Shipping Board in June, 1921.....	52,000.00

Total estimated fund..... 3,311,447.34

Only two payments of \$100,000 each will have been made on account of repayment to bond loan for 1922 as of August 31, 1921.

INDIAN PROJECTS, MONTANA.

BLACKFEET PROJECT.

August weather was hot and dry. There were no severe storms, most of the precipitation being due to local showers, and, except for the last few days of the month, there were no severe winds.

The work was confined entirely to operation and maintenance. The four systems of the project were operated, but only to very small capacity and little new acreage was covered. In addition to doing the regular operation work the water masters and ditch riders were engaged in cleaning ditches, raising banks, and making minor repairs to structure.

A carpenter and one helper completed moving the family operation and maintenance camp on to the reclamation camp site and remodeling it.

Except for a few late crops, most of the harvesting was done at the end of the month and thrashing was just commenced. The crop yields on an average will be only fair, although there were some excellent crop returns.—*R. M. Snell.*

FLATHEAD PROJECT.

At Dry Creek Canal excavation was in progress by Government forces near station 66+00 and amounted to 2,470 cubic yards, of which 1,968 were class 1; 452, class 2; and 50, class 3. Two bridges were constructed. Work was discontinued August 27, the portion of the canal to be lined under contract 858 having been excavated. Work under contract 858 consisted of finishing canal section and placing concrete lining between stations 186+55.8 and 189+00; 253+48.4 and 261+00; 263+07.5 and 267+50; 263+74.3

and 272+66.8, totaling 1,704.8 linear feet, allowing for overlap in stationing, or 24,611 square feet of concrete.

Thrashing of spring and winter wheat was in progress and the second cutting of alfalfa was completed.

Live stock continues in excellent condition.—*C. J. Moody.*

FORT PECK PROJECT.

August weather was favorable for construction work and harvesting. Irrigation was confined to gardens and alfalfa.

The siphon at station 628 Poplar River C Canal was practically completed. The P. & H. drag line worked throughout the month on Poplar River C Canal.

Practically all grain was cut at the end of the month and thrashing was about two-thirds completed. Yields were fair but not up to previous estimates.—*S. A. Kerr.*

GENERAL OFFICES.

Washington office.—Director Davis was in the West during the entire month, visiting a number of the projects in company with Secretary Fall. During his absence the office was in charge of Assistant Director Morris Ben as acting director.

The chief counsel was in the office the entire month.

During the month approximately 5,000 requests from ex-service men were received for information concerning the openings of public land on the North Platte and Shoshone projects on September 9 and 16, respectively. It is estimated that the total number of such inquiries received by the Washington office and the two project offices amounted to between twenty and twenty-five thousand. A preliminary report concerning the opening on the North Platte states that applications for the 223 farm units available were filed by 3,436 ex-service men from 36 States, the District of Columbia, and Canada, and that 90 per cent of the winning applicants are farm trained and of a superior class.

The manuscript for the twentieth annual report was practically completed at the end of the month.

On August 20 the Secretary approved a recommendation that authority be granted to execute a contract with the Lower Platte Irrigation Association providing for the cooperative investigation of arid lands in the Platte River Valley, Nebr., the association to provide \$20,000 and the Department of the Interior \$10,000 for the work.

Denver office.—Chief Engineer Weymouth visited the Boise, King Hill, Umatilla, Yakima, Columbia Basin, and Minidoka projects, returning to the Denver office on the 18th. He left for the West again on August 29 to join the Secretary's party. En route he stopped on the Huntley and Flathead projects. Assistant Chief Engineer Walter returned from Wyoming on August 12, and then left for the Belle Fourche project to submit testimony in the hearing of the case of Donahue & Murray. He returned to the Denver office on August 22. Official visitors included Messrs. Andrew Weiss, S. O. Harper, J. R. Alexander, and William M. Green. State Engineers F. C. Emerson, of Wyoming, and A. J. McCune, of Denver, were Denver office callers.

The principal work accomplished in the Designing Division during the month consisted of preliminary designs for fish ladder for diversion dam, Belle Fourche project; drops for Two-Medicine Canal and controlling works at outlet to Four-Horns Reservoir, advertisement for gates and operating mechanisms. Blackfeet project; new project office building. Fort Peck project; valve chamber structure for King Hill siphon, design for wooden flume over Big Alkali

⁴ Contra.

Creek and drawing for special siphon castings, King Hill project; drawing showing location of structures and drawings for metal road culverts, siphons, and minor structures, Lower Yellowstone project; special measuring device, Dodson North Canal and advertisement for metal flume, Milk River project; advertisements for purchase of steel bents and metal flume, Newlands project; advertisements for purchase of siphons and designs of culverts, checks, auxiliary headworks structure and minor structures, North Platte project; revision of estimate of Mill Site Reservoir, Orland project; prepared tracing of Rock Canyon Reservoir and compiled and bound Savage-Munn Report, Pueblo Flood Investigations; designs for Wind River Diversion Dam, drawings for miscellaneous gates and advertisement for purchase of metal work, Wind River Diversion Dam, Riverton project; preliminary designs and estimates for various types of dam at Willwood diversion site, Shoshone project; advertisement for purchase of ventilating ducts, Strawberry Tunnel, Strawberry Valley project; review of plans for new town site of American Falls, Snake River storage project; designs and estimates for proposed domestic water supply system, Uncompahgre project; advertisement for purchase of turnout gates, design of corewall and review of board reports for Tieton Dam, Yakima project; revision of drawings for the B-Lift pumping unit lateral system structures and advertisements for purchase of gates and flume material, Yuma auxiliary project; preliminary designs of rock fill dams at both A and C sites, Boulder Canyon Reservoir; maps and hydrographs for use in connection with report, Owens Valley project; tracings of Alamo Gordo Reservoir, upper and lower dam sites and comparative designs and estimates of earth dams, Pecos River project; preliminary design of Green River Diversion Dam, Green River Project; review of plans for Thompson Valley Reservoir, Silver Lake Irrigation District. Work was continued on standardization drawings of lock joint concrete pipe forms, radial gates, turnout gates, and geared lifts.

The principal work accomplished in the Electrical Division consisted of studies of generator shafts, Minidoka power plant, Minidoka project; consideration of repairs to Lahontan power plant penstocks, Newlands project; studies of U. P. Railroad crossing under transmission lines and installation of elevator at Pathfinder Dam, North Platte project; studies relative to operation of Salt River power system, Rio Grande project; estimates of cost of power plant at Pilot Butte site, Riverton project; continuation of work on design of Shoshone power plant and appurtenant structures and design of transmission line, Shoshone project; studies relative to proposed extension of the Yuma Valley drainage pumping plant, Yuma project; and studies relative to general arrangement of the B-Lift pumping plant, Yuma auxiliary project.

The legal division revised and completed form of contract for supplemental construction on the Okanogan project, involving an expenditure of \$150,000. In conference with J. R. Alexander, district counsel, the project manager, chief engineer, and others, a final draft of contract was made to be entered into with the Orchard Mesa Irrigation District, involving an expenditure of \$1,000,000. A redraft of contract with the Langell Valley Irrigation District was made, involving an expenditure of \$650,000.

The Reclamation Record.

Issued monthly by the Reclamation Service, Department of the Interior, under the authority of the Secretary of the Interior.

Copies of the RECLAMATION RECORD will be sent free of charge to any water user on our reclamation projects. The subscription price to others is 75 cents a year, payable in advance. Subscriptions may be forwarded to the chief clerk, United States Reclamation Service, Washington, D. C., and remittances (postal money order or New York draft) should be made payable to the special fiscal agent, United States Reclamation Service. Postage stamps will not be accepted.

Material for publication in the RECLAMATION RECORD should be addressed to *Editor*, United States Reclamation Service, Washington, D. C., and should be mailed in time to reach the editor not later than the 14th of the month in order to insure publication in the succeeding month's issue of the RECORD.

HUGH A. BROWN, EDITOR.

SUBSCRIPTION BLANK.

Reclamation Record.

[To be used only by persons who are NOT water users on the projects of the U. S. Reclamation Service.]

_____, 1921.

CHIEF CLERK,

U. S. Reclamation Service,
Washington, D. C.

DEAR SIR: I am NOT a water user on one of the projects of the U. S. Reclamation Service, but wish to receive the RECLAMATION RECORD each month.

I inclose herewith 75 cents for a year's subscription beginning with the current issue.

(Name.)

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(City and State.)

(Write plainly.)

NOTE.—Send money order or New York draft, made payable to Special Fiscal Agent, United States Reclamation Service. Do NOT send stamps.

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 CHARLES V. SAFFORD, Administrative Assistant to the Secretary.
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WASHINGTON, D. C.

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DENVER, COLO.

F. E. Weymouth, chief engineer, Tramway Building, Denver, Colo.; R. F. Walter and C. P. Williams, assistant chief engineers; Miss L. H. Miesel, secretary to the chief engineer; J. M. Gaylord, electrical engineer; J. L. Savage, designing engineer; James Munn, consulting engineer; J. L. Burkholder, drainage engineer; W. L. Drager, office engineer; J. M. Luney, chief clerk; A. McD. Brooks, purchasing agent; Harry Caden, special fiscal agent.

FIELD LEGAL OFFICES.

Boise, Idaho.—B. E. Stoutemyer, district counsel. Projects: Boise, Minidoka, King Hill, and Jackson Lake Enlargement; R. M. Patrick, district counsel, located at American Falls, Idaho.

Denver, Colo.—Law section office of chief engineer: E. E. Roddis and Armand Offutt, district counsel; J. J. Buck, assistant district counsel.

El Paso, Tex.—P. W. Dent, district counsel. Projects: Rio Grande, Carlsbad, and Hondo.

Las Cruces, N. Mex.—Mark B. Thompson, attorney in charge of litigation on Rio Grande and Carlsbad projects.

Helena, Mont.—W. J. Egleston, district counsel, Helena, Mont. Projects: Blackfeet, Flathead, Fort Peck, Huntley, Milk River, St. Mary Storage, Sun River, North Dakota Pumping, Lower Yellowstone, and Shoshone.

Mitchell, Nebr.—J. N. Beardslee, district counsel. Projects: North Platte and Belle Fourche.

Montrose, Colo.—J. R. Alexander, district counsel. Projects: Grand Valley, Uncompahgre, and Strawberry Valley.

Portland, Oreg.—H. L. Holgate and D. G. Tyree, district counsel. Projects: Yakima, Okanogan, Umatilla, and Klamath.

San Francisco, Calif.—Henry A. Cox and A. B. Fulton, district counsel, 349 Pacific Building. Projects: Salt River, Yuma, Orland, and Newlands.

PROJECT ORGANIZATION.

Belle Fourche Project.—B. E. Hayden, project manager, Newell, S. Dak.; R. C. Walber, chief clerk; August Lewin, fiscal agent.

Boise Project.—J. B. Bond, project manager, Boise, Idaho; E. R. Mills, chief clerk; C. F. Weinkauff, fiscal agent.

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Grand Valley Project.—S. O. Harper, project manager, Grand Junction, Colo.; G. H. Murphy, chief clerk; A. H. Hall, fiscal agent.

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Lower Yellowstone Project.—L. H. Mitchell, project manager, Savage, Mont.; C. A. Denman, chief clerk.

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Minidoka Project.—Barry Dibble, project manager, Burley, Idaho; Dana Templin, engineer; E. C. Diehl, chief clerk; Miss A. J. Larson, fiscal agent; F. A. Banks, engineer, American Falls, Idaho.

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North Platte Project.—Andrew Weiss, project manager, Mitchell, Nebr.; H. W. Bashore, engineer, Fort Laramie Division; Paul Rothli, irrigation manager; J. R. Ummel, chief clerk; Miss A. L. Perrine, fiscal agent.

Okanogan Project.—Calvin Casteel, project manager, Okanogan, Wash.; W. D. Funk, chief clerk and fiscal agent; H. J. Gault, engineer, Conconully Wash.

Orland Project.—R. C. E. Weber, project manager, Orland, Calif.; E. T. Eriksen, engineer; C. H. Lillingston, chief clerk and fiscal agent.

Rio Grande Project.—L. M. Lawson, project manager, El Paso, Tex.; T. W. Parry, irrigation manager; C. A. Peavey, chief clerk; L. S. Kennicott, fiscal agent.

Riverton Project.—H. D. Comstock, project manager, Riverton, Wyo.; R. M. Conner, engineer; G. H. Baird, chief clerk; J. C. Thraillkill, fiscal agent.

St. Mary Storage Division.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk; H. E. Bruce, fiscal agent.

Salt River Project.—Being operated by the Salt River Valley Water Users' Association; C. C. Cragin, general superintendent and chief engineer, Phoenix, Ariz.

Shoshone Project.—J. S. Longwell, project manager, Powell, Wyo.; J. E. Iaklich, engineer; C. M. Jump, superintendent of irrigation; W. F. Sha, chief clerk; Miss L. C. Drinkwalter, fiscal agent.

Strawberry Valley Project.—W. L. Whittemore, project manager, Provo, Utah; J. E. Overlade, chief clerk and fiscal agent.

Sun River Project.—G. O. Sanford, project manager, Great Falls, Mont.; H. W. Johnson, chief clerk; Miss M. G. Valentine, fiscal agent; G. A. Benjamin, irrigation manager, Fairfield, Mont.

Umatilla Project.—H. M. Schilling, project manager, Hermiston, Oreg.; M. D. Scroggs, superintendent of irrigation; G. C. Patterson, chief clerk and fiscal agent.

Uncompahgre Project.—L. J. Foster, project manager, Montrose, Colo.; A. H. Peach, chief clerk and fiscal agent.

Yakima Project.—J. L. Lytel, project manager, Yakima, Wash.; R. K. Cunningham, chief clerk; J. C. Gawler, fiscal agent; J. G. Heinz, engineer, Sunnyside, Wash.; J. S. Moore, superintendent of irrigation, Naches, Wash.; F. T. Crowe, engineer in charge construction Tieton Dam, Rimrock, Wash.; C. E. Crownover and C. F. Gleason, engineers; V. G. Evans, chief clerk; C. B. Funk, fiscal agent.

Yuma Project.—P. J. Preston, project manager, Yuma, Ariz.; R. M. Priest, superintendent of construction; S. A. McWilliams, engineer, Yuma Mesa Division; E. R. Schepelmann, chief clerk; E. M. Phillebaum, fiscal agent.

INDIAN PROJECTS.

Blackfeet Project.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk and fiscal agent.

Flathead Project.—C. J. Moody, project manager, St. Ignatius, Mont.; F. E. Smith and N. B. Hunt, engineers; J. M. Swan, chief clerk; J. F. Siebenelcher, fiscal agent.

Fort Peck Project.—S. A. Kerr, project manager, Poplar, Mont.; Henry Berryhill, chief clerk and fiscal agent.



KING HILL PROJECT OFFICE AND EMPLOYEES.

Left to right: C. W. Lett, stenographer; Walter Ward, project manager; William B. Richmond, property clerk; Robert B. Smith, chief clerk; Miss Waneeta S. Howe, stenographer (transferred to Klamath project); W. S. Gillogly, purchasing agent; L. D. Eakin, fiscal agent and bookkeeper; A. M. Rawn, engineer; T. W. Hause, costkeeper; E. C. Lanton, engineer.

12, no 11

The Reclamation Record

ISSUED MONTHLY BY THE RECLAMATION SERVICE
DEPARTMENT OF THE INTERIOR, WASHINGTON, D. C.

Better Farming : Better Business : Better Living

THERE CAN BE NO SURER INSURANCE FOR THE NATION THAN TO PUT ITS MEN UPON THE SOIL

VOLUME 12. No. 11

NOVEMBER, 1921





WAR VETERANS MAKING GOOD ON NORTH PLATTE PROJECT, NEBR.-WYO.

1. The Pease homestead, Cherry Creek Valley. Wheat in shocks. 2. The W. A. Mallory homestead. Mr. Mallory was formerly from Kansas and his wife from Florence, Ala. (See p. 500.)

TIETON EXHIBIT, WASHINGTON STATE FAIR.

By J. L. Lytel, Project Manager, Yakima Project, Wash.

THE twenty-fifth annual Washington State Fair held in Yakima, September 19 to 24, 1921, was pronounced the "best ever" in attendance, exhibits, and attractions. The total attendance of 87,000 was 23,000 more than in 1920. The State commissioner of agriculture expressed himself as highly pleased with this year's fair, and plans are already under way for a still bigger show next year.

Through courtesy to other counties, Yakima County did not compete in the county contests, in which first place was taken by Spokane County; but in a contest between districts in Yakima County, arranged in lieu of the Yakima County exhibit, the Yakima project carried off not a few of the honors. A display from the Tieton Division took first premium offered for district exhibits, scoring 81 points out of a possible 100 and second place went to the Grandview District of the Sunnyside Division of Yakima project.

One hundred and eighty-one varieties of products were included in the Tieton exhibit, including fruit,

grains, corn, Irish and sweet potatoes, and other vegetables, melons, peanuts, popcorn, hops, and sunflowers. There were 33 varieties of apples, 6 of crab-apples, 7 of pears, 5 of peaches, 9 of grapes, 6 of melons, 3 of plums, and 3 of prunes. Eighty Tieton ranchers furnished products for the exhibit, which were collected and arranged by Secretary Floyd Foster, of the Tieton Water Users' Association, assisted by J. S. Moore, superintendent of irrigation on the Tieton Division, and several ranchers.

Residents from the project were appointed to spend a portion of each day at the Tieton booth to give out information, and this proved to be very popular both with the public and those on duty. Those serving in this capacity were J. B. Weever and G. B. Dash on Tuesday, W. M. McKinney and E. L. Sears on Wednesday, Roy Gilbert and Mrs. G. H. Franklin on Thursday, and A. B. Dalthorp and J. S. Moore on Friday. Mr. Foster, secretary of the water users' association, was on duty a portion of every day.

MINIATURE FARM.

EXHIBITED AT COUNTY FAIRS ON MILK RIVER PROJECT.

By C. C. Wright, Agricultural Agent, Milk River Project.

A NEW feature at two of the county fairs on the Milk River project, Montana, this year was the exhibition of a miniature irrigation farm. This farm represented 80 acres and was equipped with regular irrigation structures, main canal, field ditches, and farmstead buildings worked up in miniature. The purpose of the exhibit was to illustrate different irrigation methods, and to make the border-check method most prominent, since it is thought that this

method can be used most effectively on a large number of farms on the project. The exhibit also suggested a crop rotation of wheat, corn, oats, and alfalfa, by showing different parts of the 80-acre plot growing these crops. Water was supplied by an attached hose, which was buried at one end of the miniature canal, and the small fields were irrigated several times each day during the fair. A chart was displayed in connection with the exhibit giving the water requirement of different crops, and showing the irrigable and irrigated area of Valley and Phillips Counties, as follows:

	Valley County.	Phillips County.
Irrigable acreage.....	28,000	41,000
Irrigated acreage in 1921.....	4,000	7,000

Other special features of the fair were the community exhibits, the pure-seed show, and the child-welfare work.

Twenty-four farm-bureau seed growers entered exhibits in the seed show. The quality of seed, representing the different standard varieties of farm crops, selected by the farmers, was excellent. The

(Continued on page 500.)



Miniature 80-acre farm.



Cooperation.

A JUST cause rarely requires a fight to secure adjustment. A spirit of friendly cooperation always brings results. During the past few years the relations between the Service and the farmers have grown cordial and intimate. The big irrigation system built and operated by the Service is now looked upon as their own property, and a helpful spirit of cooperation in its operation has become quite general. The association meetings are concerned with divers problems of importance to the project, its people, their financial, social, and spiritual welfare. We find them promoting organizations for selling, encouraging more intensive and scientific methods of agriculture, better roads and schools, more economical local government, and in numerous instances wielding a powerful influence upon the legislature in securing necessary laws, reduction of taxes, etc.

These forwarding-looking, progressive associations are developing strong and intelligent leaders who are gradually unifying all the activities of the project until it functions like a huge corporation. On such projects the life of the individual member is broadened and brightened by association and close partnership with his fellows. Monotony has no place and

intellect is quickened through opportunity for expression of ideas and consideration of the views of others. Many of these leaders have devoted their energy and thought to their fellow men from sheer love of service and without financial reward.

It is gratifying to note that recognition of their faithful service does not wait always until they have passed on. Now and then a grateful public gives expression of gratitude, pronounced and emphatic. We note an instance of this kind on the Rio Grande project, where the farmers of Dona Ana County paid a remarkable tribute to H. H. Brook, president of the Elephant Butte Irrigation District. In addition to passing unanimously a resolution expressing the general esteem and affection in which he is held by his colleagues, they presented him with a further evidence of their regard in the form of two beautiful and useful gifts. Mr. Brook feelingly responded by stating that he appreciated far more than anything else the kindly sentiment that prompted the farmers to join in the presentation, and promised in the future as in the past his best thought, time, and energies would be devoted to furthering the interests of the farmers of Dona Ana County.

Better than graven monuments of marble after we are gone are the simple evidences of affection and esteem which our friends accord us as we journey along life's pathway. Our compliments are to the Dona Ana County farmers on a good deed well done, and to Mr. Brook, the faithful servant of the people, that recognition of his services has come at this time.

Ex-Service Men as Farmers.

The preference right to file on land, accorded by Congress to veterans of the World War, was not applicable to irrigated land until the opening of two areas in Wyoming, on the North Platte and Shoshone projects, March 5 and 13, 1920, respectively. Previous to these dates there were no desirable unentered farm units on any of the projects. The applications for the 137 farms opened to entry totaled 3,844. The good faith of each applicant was evidenced by a deposit of approximately \$5 for each irrigable acre in the farm selected. The second openings of land occurred on the same projects September 9 and 16, 1921, and applications totaling 3,657 were filed for the 280

Miniature Farm.

(Continued from page 499.)

show attracted a good deal of attention and will doubtless result in a greater number of farmers standardizing their crops.

Three communities entered exhibits consisting of a collection of grains, grasses, vegetables, fruits, canned goods, etc. The community exhibit idea is new in the counties this year and hence was a little difficult to get started, but it is safe to say that next year will probably witness a large number of these exhibits.

The booth under the supervision of the county nurse, demonstrating modern methods in the care of children, proved to be a popular feature. This work will probably result in greater interest in child-welfare work among the people generally. The exhibits were furnished by the State Anti-Tuberculosis Association.

farms available on those dates. For the openings for 2 years therefore there were 7,501 applications covering 417 farms. The applicants registered from 36 States, Canada, and the District of Columbia, showing the almost nation-wide interest in land on the part of ex-service men. The net material results to Wyoming are an addition of 417 heads of families, or prospective heads, from many States to the citizenship of the State—an increase of approximately 28,580 acres of irrigated land changed from nontaxable condition into cultivated farms with houses, stock, and other improvements; crops in a few years averaging an annual gross return of at least \$50 per acre; the establishment of two new towns and the building of a railroad into the valley.



Secretary Fall and Gov. Davis, of Idaho, on the Shoshone dam.

During a recent visit to both projects the writer interviewed several of the ex-service men who took up land a year ago last April. It was stated by well-informed men on the projects that the majority of the newcomers were possessed of a small amount of money, and during the season had been forced to engage in outside work in order to finance the preparation of their own land. Naturally this need of money made it impossible for them to get the whole farm into crops the first year. The Reclamation Service found employment at various times for a good many of them; others obtained temporary jobs on neighboring farms or in the near-by towns. Considering these drawbacks the progress made in developing the land was quite satisfactory. On the ranches whose owners were possessed of the necessary capital the improvements were excellent. We saw excellent crops of beets growing on new land, good yields of wheat in shock, and in one instance a splendid stand of alfalfa. The homes were generally better than the usual homestead shacks. (See p. 498.)

There were a few pessimists among them, but the majority were cheerful and full of pluck, especially on the North Platte project. On the Shoshone project the conditions were not so cheering. Here the lands are harder to subdue, have less humus, and will require a longer period of cultivation to bring them into full production. These drawbacks are offset in part at least by a milder climate and more attractive natural surroundings. It is evident, however, that the settler on the Shoshone requires a larger capital than on the North Platte. The lands on the former are barren of grass, whereas on the latter there is a good native grass affording grazing and producing some hay when irrigated.

It is pleasing to note that a very large percentage of the settlers are farm trained and accustomed to hard work. They have the true pioneer spirit and apparently are not dismayed nor discouraged. The relinquishments are surprisingly few, and in each instance reported to us the land was transferred at a good price.

The views of a number of the soldiers were obtained. They throw an interesting light on the problem of making a home in the desert from the viewpoint of the chaps who are actually doing it. In many of these statements stress was put upon the fact that small advances of cash during the first years would insure a greater measure of success and probably prevent failures in many cases.

The general opinion of the men with whom the subject was discussed was in favor of preliminary development of the land by the Government so that the entire acreage could be put into crop the first year and a lot of the mistakes which the newcomer is bound to make be avoided. The revenue from a farm only partly in crop is frequently too small to carry the farmer over until he can get all the land in cultivation. There is a loss of a year's time, which is worth at least \$1,000. This time, if expended in caring for a crop, would probably result in an income sufficient to tide over the winter and start things moving in the spring. The Government's expenditures in preparation of the land, seed, etc., could be added to the cost of water right. The capital of the soldier could be employed in purchase of stock and equipment.

The drift from the country to the city which has been continued for two decades was greatly accelerated by the war, which created an enormous demand for labor, highly paid. In our slow return to normal conditions this demand has greatly lessened, and as a result a renewed hunger for land is apparent. When wages slump the lure of the city is no longer compelling, and thousands of farm-trained citizens are now turning longing eyes to the country.

This condition has always followed war. The years after the close of each of our national struggles have

seen a strong movement to the land, and the World War is certain to prove no exception.

Nearly a million sturdy sons of the farm donned the uniform of our country and rendered service in the great struggle. Many of these have since reached the age of majority and naturally are seeking a home on the land. To not a few of these a future on the old farm is uninviting; they have the natural longing to strike out for themselves.

Much has been written about the unfavorable condition of agriculture in the country to-day, and a lot of it is true. The farmer has been hard hit by the slump in prices of his products. It should not be overlooked, however, that he is not the only sufferer. Every industry in this country is undergoing a readjustment in getting back to normalcy. No one believes that the present depression is anything but temporary. The teeming millions of the world must eat and the farmer must feed them. As this is written things are on the upturn. Credits for the farmer are being arranged. Our foreign markets are being financed and are demanding more and more of our foodstuffs. It requires no particular gift of acumen to foresee a strong movement forward, and this must of necessity be followed by a restoration of land values. Now is the time to buy if you buy right.

The desire to own land is instinctive with most Americans, and its gratification is a matter of national concern because the stability of the political institutions of the Republic is assured only when the majority of its citizens are fixed to the soil. To-day 51 per cent of our people dwell in cities and towns. The rate of increase in urban population is out of proportion to that of the rural. While we are crowding the cities to the limit, farm abandonment is on the increase. Never in our history was there greater need than to-day for a wise policy of rural reconstruction. While hundreds of political economists are spilling ink explaining the causes for the decline in agriculture, few are suggesting a satisfactory remedy.

We all realize that something fundamental is wrong, but apparently the evil has not yet been attacked from the angle of discovering a cure. During a period of 50 years, 1850-1900, our improved farm area increased at the rate of 6,000,000 acres a year, an addition annually of 85,000 farm homes. From 1910 to 1920 the increase in improved land was only 28,530,551 acres, or 86,864 farms. The larger part of this acreage increase was due to the opening of 640-acre grazing homesteads, which contributed little to our food supply as they were previously used as a cattle range. In other words, the rate of agricultural progress as evidenced by the number of farms added between 1910 and 1920 fell off 90 per cent. In some of the States the abandonment of farm homes resembles an exodus. In Ohio, for instance, the number of vacant farm houses increased from 18,000 to 29,000, or 61 per cent, in a single year, and the number of men and boys on

the farms decreased 30 per cent in the same period. In 1919 Michigan's vacant farms increased from 11,831 to 18,232, and in two years 46,000 men left farms totaling 1,666,000 acres. The loss in New York State in 10 years was 22,540 farms. It comes with something of a shock to note that the area in cultivation in the United States in 1920 was 5 per cent less than for 1919.

Such statistics are most depressing, and we may not carelessly dismiss them. This condition of agriculture surely warrants most careful consideration and prompt remedial action.

While forebodings are prevalent and a lot of *crêpe* hanging is going on, at least there is one section of the country where agriculture is still buoyant and robust. In the irrigated West the increase in the number of farms is at a normal rate, and generally speaking the farmers are less oppressed by the reaction of the world's industries. Prices are indeed low, but the farmer is hopeful and undaunted. Just what is the secret of his optimism? While his brother workers in other States are lifting their voices in lamentation or leaving the farms in droves, why is he cheerful and forward looking? In revealing his secret may we not hope to find the remedy we are seeking? A comparison of farming conditions in the irrigated West with those sections elsewhere where decline in agriculture is marked show one very pronounced difference. In the West agriculture is communized and largely cooperative; in other sections it is individualistic and unorganized. Especially true is the latter in the regions wherein farm abandonment has become so menacing. It appears then that the primary step toward a rural reconstruction lies in the direction of developing a community spirit. The decline in farming is not due to the failure to obtain a living so much as to the kind of social and spiritual existence which it offered. Isolation, monotony, lack of conveniences and modern comforts will be found to have contributed more largely to the desertion of the land than inability to make the soil produce a living. Large farms, scattered population, bad roads, poor schools, insufficient medical attention are curable ills if rural expansion is rightly directed.

The ambition to own land is not dead in the American heart, but its gratification for most of us is remote unless opportunities are increased and a sounder policy of creating new and higher forms of rural life is established. In formulating such a policy the examples of Australia and New Zealand and of our own commonwealth of California may well be taken. In working out such a policy the active cooperation of the Federal Government, the States, and all the industrial organizations of the country should be actively engaged.

A nation-wide reclamation policy formulated along lines of the present irrigation act would enormously stimulate such a work and lay a broad foundation for its expansion.

NOTED HERE AND THERE.

Arizona, Salt River project.—No more cheering news has come from Arizona's "Garden of Allah," the Salt River Valley, than the report of a strong return to dairying. In this connection it is pleasing to record a notable addition to the royally bred Guernsey stock of the valley in the form of the superb May Fly, one of the best known bulls of the family. His dam produced 814 pounds of butter fat in one year, equivalent to 1,000 pounds of butter; his sister from the same dam made 991 pounds of butter. Eight other dams and close relatives averaged more than 800 pounds of butter on year records. So far as known May Fly has the highest butter record behind him of any herd sire ever brought to the State. His owners, Frank Reed Sanders and William Walton, are rendering a great service to the valley and the State in bringing such a distinguished member of the Guernsey strain to the project.

Those of us who are willing to admit a recollection dating so far back as 1902, when the reclamation act was passed, will remember the oft-expressed criticism by the lawmakers of the provision of the act which gave the Secretary of the Interior authority to turn over the management of a project to the water users. There were many who scoffed at the idea of letting a lot of farmers take over a \$1,000,000 plant and run it. "Perfectly absurd," they said. "It can't be done."

Well, it can be and is being done to-day, and not a piffling million-dollar ditch system either, but a \$14,000,000 corporation with huge power plants, interlocking canals, pumping units, and everything. Housed in a magnificent office building, which is a credit to the enterprising city of Phoenix, the Salt River Valley Water Users' Association, the first to be formed under the irrigation law, is strictly on the job of managing one of the large irrigation systems in the United States, and without a taint of politics. One of its achievements of recent record, in addition to the biggest thing it does—the efficient delivery of water—is a reduction in operation cost of 60 per cent, from \$4.40 to \$1.74 per acre. This saving to the farmer will be especially welcome, as he has just received notice that his county tax rate has been increased by 79 per cent.

It is to be noted further that the association has created a bank balance of \$200,000, it has spent a large amount for drainage, and it is advancing money to its members. Its sales of power from its several plants, including that at Roosevelt Dam, are sufficient to cover all operation costs and are partly being accumulated to return the Government's investment.

Considering the variety and complex character of its activities, the magnitude of its operation, and the difficulties of satisfying the demands of the 5,000 farmers who own the stock, where will you find a better example of a cooperative enterprise than this?

The most wonderful intellect in our Nation to-day can not visualize what this Republic would be if our whole agricultural industry could be organized to function and perform as it does in Salt River Valley.

What organization and cooperation have done for the farmers down there would require a volume to describe, and yet they are only at the beginning of a new epoch in farming, the most progressive and forward-looking the world has ever known.

California, Orland project.—Orland farmers who have created a Project of No Regrets by mixing

brains with their farm work are consistently improving their dairy and other live stock. They are on the market always for something good, and they do not hesitate about the price if the quality is there.

The Hembre herd of pure bred Jerseys from Oregon was offered in part at a recent sale in Orland, and all but two of the lot were purchased for the project dairies. The average price paid, including the young stuff, was \$170 per head, with \$460 topping the sale. The most popular strain in the lot sold descended from Brilliant Spring, a championship cow formerly owned on the project. Her daughter, Golden Bell, sold for \$460, and her calf for \$105. Steady buying of such stock is a guarantee that Orland is in the dairy game to stay.

Colorado, Grand Valley project.—The western slope's fruit and produce crop is rolling out to the distant markets. Grand Valley peaches distributed even to remote eastern and southern points, her pears gracing the tables of the luxury loving dwellers in our great cities, and her apples just now appearing in markets from coast to coast are putting the name of the valley in the hall of fame for perfection, flavor and color. With her neighbor, the Uncompahgre, she is crowding the railroads with iced cars of onions and potatoes. Up and down these valleys the highways are jammed with wagons and auto trucks loaded with fruit and produce for the loading stations. Up to October 8, 4,752 carloads had been started out, and probably the equivalent of 75 cars more went by express.

Colorado, Uncompahgre project.—Ash Mesa, one of the show places on the Uncompahgre project, is farmed by men who believe in cooperation, and the prosperity and success which have resulted from this get-together spirit have developed a spirit of neighborliness which has brought happiness and content into their lives. A practical example of the cordial relations of the people was given recently when ten farmers banded themselves together for the mutual handling of their crops by constructing a huge storage cellar located in a hill close to Sage Switch, one and a half miles south of Delta. This cellar is 40 by 160 feet with 8 by 10 ceiling, and has a storage capacity of 20,000 bags of potatoes or onions, or about 65 carloads.

This storage, convenient to shipping, eliminates the necessity of selling from the field, always hazardous, has an advantage of the home cellar in that it avoids transfer of produce in freezing weather, and further enables the farmers to offer quantity supply to the buyer at a moment's notice.

Idaho, Minidoka project.—About this time of the year we are due for a lot of stories of prize crops. The Minidoka project comes forward with a prize-winning pumpkin grown by Thomas Blacker and weighing 72 pounds. Let us now hear from the other projects.

The total valuation of Minidoka County, which is practically the project, has been fixed by the State Board of Equalization at \$9,250,000. The valuation of farm lands was raised from \$45.60 to \$63.40 per acre, making the total \$3,744,941.20. Ever stop to remember what the valuation of these lands was in 1904, before the irrigation work was begun?

The electric project's 7,000-acre crop of spuds is coming out of the ground, and it is a veritable eruption. The scientifically planted farms are running

high in quantity and quality, and on only those which were planted with inferior seed are the yields light.

The fact that the very best potato crops are to be found in fields where careful selection of seed has been practiced should be appreciated by our farmers. While some of the fields planted with select seed may show scab and other soil disease, every field is showing a good yield, from 200 to 300 sacks to the acre. This is in decided contrast to some yields of 50 to 75 sacks from inferior seed.

Montana, Lower Yellowstone project.—Richland County annexed 60 prizes at the State Fair recently, among which were 25 corn ribbons. Frank Kerr, of Savage, got a big send-off with his Minnesota 13 corn, and as a result was encouraged to send 10 ears to the National Corn Show at Chicago and 10 ears to the show at Miles City. His exhibit in Montana attracted considerable attention, and orders for seed have been received for several hundred bushels. His crop on 20 acres will run from 50 to 60 bushels per acre. Mr. Kerr has been confounding the doubters who have maintained that corn can not be grown profitably in the Yellowstone Valley. We wish him success in Chicago.

Nevada, Newlands project.—During the season the shipments of cantaloupes from the few ranches growing for market averaged approximately a carload a day. The consignments were mostly to near-by small local markets, and the demand continued strong until the close. There is promise of the future development of this industry as predicated in the very satisfactory reports coming from all consignees.

It is evident that the Lahontan Valley cantaloupes are in demand, and with care in production of the best and selection in packing and shipping a successful industry can be built up in this valley that will bring in a lot of money during the melon season every year.

One carload went to Pittsburgh as a "feeler," and the market quickly absorbed it. The sales report is interesting. "Total sales receipts, \$1,019.70; expense, including freight, commission, and ice, \$700. Government market report shows quality best on market this season and pack excellent. Lahontan melons are going to be a big factor next season."

Cantaloupe enthusiasts are predicting 1,000 acres will be planted to cantaloupes next year, and instead of the \$20,000 crop of 1921, it will be \$300,000 in 1922. Hasten the day when the "Heart of Gold" brand shall appear on our markets here.

After cantaloupes are off the project farmers begin to fatten up the gobble crop, for which the California epicure is always eager. The turkeys of Newlands project dress heavy and reach the California market fresh and white. They always top the market. The industry should be greatly expanded with modern packing and marketing facilities. Even to-day it brings from \$20,000 to \$25,000 into the valley.

If you want to get into the farming game where agriculture is becoming well balanced, come to the Lahontan Valley. Here, with oases of alfalfa and cereals, with sugar beets, spuds, cantaloupes and fruit, and a dairy industry that is just booming, you will find a welcome.

New Mexico, Carlsbad project.—Cotton is still king on the Carlsbad project, and apparently will continue to reign undisturbed for some years to come. The importance of this crop has made it evident for some time that the project should have a cotton-oil mill, and steps are well under way to erect a \$25,000 plant

to be owned and operated by the cotton growers. The capacity of the mill is to be 16 tons of oil cake per day, from which will be extracted 352 pounds of oil worth 2 cents per pound at Carlsbad. The cake will be sold at current market prices. Oil cake is a valuable stock food, and the Carlsbad project is in a great stock country. At present the freight on a ton of cake from any of the Texas mills to Carlsbad is \$21, which amount will be saved to local feeders when the mill is in operation.

New Mexico-Texas, Rio Grande project.—From a recent issue of *Organized Farming*, issued by the Dona Ana County Farm Bureau, we take the following from an editorial as an indication of the esteem of his home folks:

"The position of the much discussed farmer under the Elephant Butte project is likened unto the man who had hold of the bear's tail. He could not hold on and he dare not let go.

"Quitting as an alternative presents no help and he must hold on.

"Fortunately, very fortunately, one of her citizens in Hon. Albert B. Fall has climbed to such heights that he is no longer of New Mexico alone, but is a citizen of America—standing out even internationally. He was not selected by our President as a member of his Cabinet for any political reason. It was his broad knowledge and ability upon which his selection was made. And this knowledge and ability must be sought to aid us in the solution of some of the problems now confronting the people who are concerned in the great international project of the Rio Grande Valley.

"But Mr. Fall is a busy man—working far into the night on problems of the Reclamation Service involving millions of people's money. The people here must get the ear of Mr. Fall and also harken unto him.

"All the problems of electric power, drainage, interest and payments, improvements, experiment stations, and all that pertains to the future of this project are in his hands. Mr. Fall can be of more service to the people of this valley than any other living man.

"The League of Nations may fail, the disarmament conference may not accomplish its high purpose, but Mr. Fall will not fail the people of his old home and State, because they will not fail him.

"Let us therefore reason together, then be in a position to intelligently ask for the things we must have in order to make our business a success."

John F. Beglinger, a graduate of the Montana State College of Agriculture and Mechanic Arts, has been appointed official tester for the Mesilla Valley Co-operative Cow Testing Association with headquarters in the Temple of Agriculture at Las Cruces, N. Mex. He will begin early in October with 600 cows in Dona Ana County.

Mr. Beglinger, who is a native of Switzerland, has been engaged in practical dairying since his early boyhood. Technical knowledge and experience was gained in the dairy course at the Montana State College. Prof. Martin, of that institution, recommends him highly as a judge and feeder of dairy stock, saying in his letter to the board of directors of the Mesilla Valley Association that he has frequently availed himself of Mr. Beglinger's services in officially testing some of the noted herds in the West and elsewhere.

S. S. Hookland, manager of the Dona Ana County Farm Bureau, with which the cow-testing association

is affiliated, says that Mr. Beglinger's work during the past 11 years has brought him into contact with leaders in the pure-bred live-stock industry, "and from these," he adds, "we have gained a favorable impression of his character and qualifications. His aim is to see the new association one of the outstanding organizations in the Southwest and we feel confident that the dairymen will cooperate with him in every way."

Dairying gives every promise of becoming an important factor in the upbuilding of southern New Mexico, particularly in the Mesilla Valley, where every condition is favorable for this highly profitable industry.

L. L. Mayfield, formerly of Mount Olive, Miss., has been appointed sales manager for the Farm Bureau Marketing Association, with headquarters in the Temple of Agriculture in Las Cruces, N. Mex. Announcing the appointment, S. S. Hookland, president and general manager of the association, said that Mr. Mayfield will handle the crop of 2,000,000 pounds of sweet potatoes grown in the Mesilla Valley this year.

Mr. Mayfield came to Las Cruces from Mississippi last January. He bought the Frenger homestead and rented a 150-acre ranch, working the land with labor brought from Mississippi. Against the advice of his banker and neighbors he planted 70 acres in Durango cotton, insisting that because of the slump in 1920 and the smaller acreage this year cotton would find its rightful price this fall.

"Mayfield's cotton is the best I have seen in the Southwest," a cotton buyer said the other day, after looking over the field. "It is free from bugs. He will make two bales on some of his acres and less on others, but on the whole he should average more than one and a half bales to the acre."

Mr. Mayfield feels confident that cotton will reach the 30-cent mark before December, "and," he adds, "it may go higher. The crop this year will not amount to more than 6,500,000 bales, which, with the carry-over from 1920, will bring the available supply up to 15,000,000. The yearly consumption is about 18,000,000 bales. There you are. The law of supply and demand will assert itself. The answer is 30-cent cotton or better.

"I'll plant 1,000 acres in cotton next year if I can get the land. We can grow as good and as much cotton, acre for acre in the Mesilla Valley, as can be grown anywhere in the Southwest. Cotton is the king of staple crops. There's no question as to its real worth."

The recent sight of 250 young Holstein dairy cows in the El Paso stock yards for local distribution should be the subject of congratulation. These young cows distributed among the valley farmers are sure fore-runners of many more, and mark the beginning of a sounder and stabler agriculture on the project. For years and years the valley has occupied the anomalous position of a shipper of hay and buyer of butter.

The bankers of the valley can do no one thing more beneficial than to extend financial aid to farmers who are equipped with barns and feed for the purchase of good dairy stock. In our frequent discussion of dairying with bankers in the West we have never found one of them who regretted the advances he made to a dairyman. Western bankers have always loaned freely to the cattleman and sheepman, and we hope they will continue so doing, but it can not be gainsaid that loans made for the purchase of good dairy cows are the safer.

Washington, Okanogan project.—Okanogan's banners flaunting the skies bear legends like these: "1921 apple crop, \$1,500,000—756,000 boxes at \$2 a box to growers—1,200 cars." "Prosperity Prospects never Brighter." Our "California of the Northwest" shines like a radiant gem up along the Canadian border. It's the biggest little valley in all the West.

J. H. Sprowl is accorded the record for the best orchard on the project. His 12-acre orchard, it is estimated, will yield 1,000 boxes per acre, and at \$2 per box will return him \$2,000 per acre, one-half of which is net profit. This orchard was thinned twice this season, the yield being so heavy as to endanger his trees.

Washington, Yakima project.—With a view of acquainting the effete and extremely provincial denizens of America's greatest city, New York, with the superior excellence of Yakima spuds, an enterprising citizen named F. M. Balcom, residing near Grandview, has shipped 40 crates of selected stock to that city. We trust his anticipations of developing a market will be fully realized. Mr. Balcom shipped his samples to Seattle, and from thence they went by steamer via Panama Canal to New York. Owing to the threat of car shortage Mr. Balcom has constructed a storage cellar with a capacity of 1,000 tons, the largest in the valley, and is prepared for any emergency.

The best wheat record for the season thus far received comes from the Benz ranch, 3 miles west of Toppenish. An 80-acre tract threshed 6,500 bushels and another 80 made 4,800 bushels. On the first 80, which topped 80 bushels per acre, the wheat was so thick that it was found necessary to use a gas engine in propelling the machinery of the binder. Figured at \$1 per bushel, this field returned a gross profit of \$6,500, or an estimated net profit of \$2,000.

Sunnyside stock growers exhibiting their fancy dairy stock, hogs, and horses carried off a wonderful lot of prize honors at the State fair. Firsts were accorded in Belgian and Percheron horses, many firsts in numerous Guernsey classes, and first and second junior heifer Holstein calves. Several of these were exhibited at the Oregon State fair, and captured a number of blue ribbons over California and Oregon contestants. The boys' and girls' clubs of the district, with exhibits of canning, gardening, and sewing, were recipients of numerous premiums.

It used to be said the packers of meat products had reduced the operation of their plants to such a degree of fineness that only the squeal of the pig was unused. Well, in the matter of saving everything we think our Yakima folks have it on the packers. In the handling of their apple crop nothing gets away more tangible than the delightful odor of the fruit. Now study this example of Yakima efficiency. The fancy and choice apples are for the outside market generally, the next best grades going to dehydrates and canneries. At these plants the apples are peeled and cored before drying or canning. The peelings and cores are then removed to another plant where with windfalls and culls are changed into vinegar. The pulp goes back to the land to enrich the soil and produce more fruit.—C. J. B.

Don't make the mistake of thinking you can raise pork profitably on alfalfa alone. It can not be done. Some grain must be fed with it.



NOVEMBER SUGGESTIONS FOR POULTRY FARMERS.

By H. O. Numbers, Poultry Expert, Loretto, Pa.

WE should be concentrating all our energies toward an ample egg supply this winter. The prevailing price on the New York market for October was 80 cents per dozen. The price for November will hang around the dollar mark. By proper handling, it will not cost you more than 25 cents per dozen to produce your eggs; that is, feed costs. Our average cost per dozen runs 22 cents, and we believe this can be greatly reduced in smaller flocks, as we pay the highest prices for feed. If you don't reap the harvest, it's your own fault.

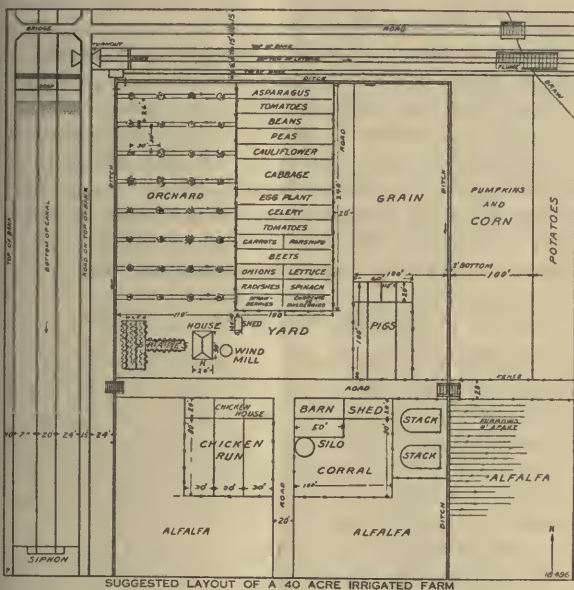
First consider the comforts you provide your birds. Are your buildings free from drafts? Let us illustrate the importance of proper housing. Three years ago we had a house containing 500 pullets. The building was modern in every respect. We used a composition roof, and in laying the paper roofing not enough lap was given over the seams. During the latter part of November we had a terrific gale blowing from the northwest, accompanied by sleet and rain. A small portion of the paper roofing was torn loose, and during the night a steady stream of cold rain poured down over about 3 feet of our roosts. About six of our choicest pullets received the full benefit of the cold bath. They contracted colds, which we did not notice for about a week. Meanwhile they had been drinking from the water fountains, and depositing the mucus in the litter. The result was, we had a "break out" of croup in our unit of 500 pullets, and we had a hard fight to battle the scourge. You can not afford to pass up anything that will add comfort to your birds. See that there are no cracks or crevices back of your roosts that will permit a draft. We have seen a number of farmers who pack leaves back of the roost. We do not favor this practice as it affords a harboring place for mites. The best plan is to line your building with a cheap roofing paper. This will keep out drafts and rain, and the tar contained in the composition is an excellent preventive of germs. Have plenty of sunlight. See that you properly ventilate. Cold air never hurt a chicken, but dampness and drafts are deadly. We

lower our windows from the top; this gives plenty of fresh air. Deep litter and a sand bath are essential. In another article we have described the sand bath.

Do not overlook regularity. Have a schedule by which you feed and attend your birds. Is your ration consistent? That is, are you feeding the right food for the location your farm is in? We refer to climatic conditions. The feed used in the South won't give the same results in a colder climate. Then again, you can't feed Wyandotts and heavy breeds the same as Leghorns. If you expect 2-ounce eggs, remember your bird must eat at least 4 ounces of solid food daily to keep her fit. Do not neglect succulent feed. Beets are excellent.

Have you any stock to market during the holidays? We offer you a simple fattening scheme. We first confine our birds in coops 30 inches wide and 6 feet long, having wire bottoms of $1\frac{1}{2}$ -inch square mesh wire. The coop is set on low trestles, and several inches of sand are placed underneath on the floor to absorb the droppings. The sides of the coop are slatted, 2 inches apart, large enough to permit the fowl to stick its head through. We provide a trough on each side and feed from outside. We feed five times daily the following: 2 parts corn chop to 1 part middlings. We moisten with thick milk or buttermilk. We give fresh water to drink and once daily we feed some celery tops. This latter is not necessary; however, our trade requires the celery flavor. We have had no success in feeding the mash "sloppy" or, as some authorities put it, "about the consistency of soup." The first few days our birds ate it, and then refused to eat, so we feed our own system and have had years of good results. The fattening process should be not less than 10 days nor more than 14. By no means take a fowl that has been process fed and turn it loose. It will soon go to pieces. Our reason for using wire bottoms in the coop is to keep the birds clean, and permit a circulation of fresh air over the body, as they become very warm as they "fatten up."

In our December article we will describe our "light system" which we employ during the winter to accelerate our egg production. In closing we trust that you are not the type of farmers who let their chickens forage for themselves and roost over the farming implements, in the haymow, or wherever they can find shelter, and expect returns after such treatment. Only recently a local farmer (not a poultryman) brought a basket of 20 dozen eggs to the local merchant for exchange for merchandise. The merchant looked askance at the unusual number of eggs, and inquired if they were fresh. The farmer declared they were "just gathered." Customers who bought them found every egg either hatched, or "ancient." The farmer needed some cash and had gone to his barn and instituted a search for eggs. He found numerous nests hidden everywhere. He told no lie—"just gathered," but not "fresh laid." Incidents such as this only boom the trade of honest farmers. People are willing to pay the price, but they exact value received.



Homemade Silo.

The following is a description of a 12 by 20 foot silo built recently on the Newlands project, similar to two other silos on the same project, erected three years ago:

The construction of these silos is very simple. It consists of 2 by 6 studding nailed to a double circular plate which in turn is bolted to a cement foundation. The inside circle of this studding is lathed with regular house lath and put on the same as house lath. Next on the inside of this lath is nailed inch-mesh

poultry netting, making the circle on the inside of the silo. This lath and poultry netting is covered with cement plaster in which much fiber is used. On top of this is placed a richer coat of unfibred cement plaster, troweled down to a very smooth surface. For the purpose of further reinforcing the studding three rows of bridging cut from 2 by 4 lumber are placed between the studding, one at the top, one in the middle, and one at the bottom. The tops of the studding are tied together by a double circular plate similar to the one on which the studding rests.

Sugar Beets.

The cost per ton of producing sugar beets on irrigated land in Utah and Idaho is relatively lower on the larger individual acreages and on farms where concentrated attention is paid to increasing the yield per acre. This is shown by investigations recently made by the United States Department of Agriculture. The cost of better cultivation was found to be more than made up by the larger crops.

A definite rotation of crops also was found to be profitable, and the value of beet tops for silage was shown to be an increasingly regarded factor in offsetting the cost of production. These conclusions are published in a new department bulletin, No. 963, "Cost of Producing Sugar Beets in Utah and Idaho, 1918-19."

Rotation is recommended to the extent of substituting a different crop once in several years. Many farmers in the sections investigated continue to raise sugar beets on the same fields year after year, declaring that the yield is better the fifth year than the second. The department's observations, however, show that land yields less after continued cultivation to one crop, and also is more susceptible to damage by insects and disease.

The National Dairy Show.

In a manner of speaking, the cow and the farm always hold the center of the stage at the National Dairy Show, but at the one held at St. Paul, Minn., October 8 to 15, they were actually on the stage in lifelike models. Instead of depending upon charts and statistics, the salient points were brought home to the observer by stage settings representing actual farm scenes and cattle, of the kind that usually go with the surroundings, shown grazing in the painted fields.

One farm breathed comfort and prosperity, and in its lush pastures grazed cattle that showed the effect of years of careful breeding. The other was the kind of farm that in the old days would have been known as Farmer Slack's place. In its pastures were nondescript cows—the kind that too many farmers still keep, but that do very little toward keeping the farmer and his family.

The reason for these two stage farms, set side by side, was evident—the striking contrast of abundance and poverty emphasized the difference in what may be expected from good and poor cows, from poor sires and sires bred from a long line of high-yielding ancestors. Poor animals soon paint the whole farm in drab colors, whereas good ones keep up the fences and brighten the buildings. The improvement is even more noticeable in the bank account.

But this series of stage scenes went farther than merely to show beautiful pictures of success and somber paintings of failure. It showed pictorially how a farm community may organize to obtain im-

provement at the lowest cost and in the shortest practicable time. One stage showed how the farmers in a community grouped their farms into blocks and organized a bull association that resulted in a marvelous development in the herds—shown in the records which were posted at the side of the stage. On another stage was a show-ring in which were six purebred bulls, and another ring in which were 19 scrubs. These models were exact reproductions in miniature of real animals, the purebreds representing the bulls owned by the first cooperative Ayrshire bull association of America, which took the place of the 19 scrubs depicted.

DAIRYING OFFERS STEADY INCOME TO RECLAMATION FARMERS.

By United States Department of Agriculture.

ALTHOUGH there are other lines of farming which sometimes pay higher returns for one or more years, there is no more certain business for the reclamation farmer to engage in under ordinary conditions than dairying. Bankers recognize this; and among the easiest loans to obtain are those for the purchase of dairy cattle, if the borrower shows a knowledge of the business and a determination to see the business through on intelligent lines. Very often banks will lend money up to the entire purchase price of the animals, if proper precautions are taken to obtain good healthy stock.

DEPENDABLE INCOME FROM DAIRYING.

Recent statistics show that dairy products are less liable to fluctuate in value than almost any other kind of farm produce. Returns may be less at times than would have been realized if attention had been devoted to certain cash crops; but year in and year out the dairy farmer who starts right and handles his business right can expect a reasonable degree of profit and a steady income.

A factor which makes dairying a safer proposition than crop farming is the quick turnover, which lessens the liability to loss by a turn of the market. Feed which is given to the cow becomes milk in a comparatively few hours. This in turn is converted into butter or cheese, or sold direct, and the money is in the producer's hands soon afterward. The returns keep coming in throughout the year, instead of compelling the farmer to wait six months or a year from the time of his first investment, as in the case of farm crops.

Dairy products are practically certain of a market. At least there has never been any long-continued overproduction. Many people have the habit of using a comparatively uniform amount of dairy products at

all times. Prices are stabilized in a measure by the fact that milk is made from hay, alfalfa, grain, and other direct products of the soil, and the price of milk products must remain up in proportion or farmers will sell their crops direct.

Dairying also furnishes a channel for disposing of crops which may be in poor demand; or on which freight rates are prohibitive. An example is alfalfa, which is an important crop of the reclamation farmer. Alfalfa seldom is profitable to ship long distances to market. Turned into butterfat, recent cases have shown where it would pay five or six times as much as if sold direct. The dairy cow produces more human food, from feed consumed, than other animals.

DAIRYING REQUIRES CONSIDERABLE INVESTMENT.

Dairying on a large scale involves a heavier investment than many other lines of farming; but a farmer determined to succeed can get a start and build up his business as he goes along. A few carefully selected cows and a bull from established butter and milk producing stock will form the nucleus of a herd that may make the owner independent in a few years.

In recent times more and more stress is laid upon the qualities of the sire of the herd, because the qualities which he brings from his ancestry are transmitted to many offspring each year, whereas the finest cow can only be expected to pass her producing qualities to one other individual animal in the same length of time.

The selection of a breed is an important matter in starting a herd. Two sources of income from dairy cattle are to be considered—the sale of products, either milk or butterfat, and the sale of surplus stock. In the United States five breeds of dairy cattle have attained considerable prominence—the Holstein-Friesian, Jersey, Guernsey, Ayrshire, and Brown Swiss.

These breeds have been carefully developed for a considerable time for the purpose of dairy production, and in consequence each transmits its characteristics with a large degree of certainty to its offspring.

Although the different breeds are alike in general dairy tendencies, each breed has peculiarities which adapt it to certain conditions. Therefore not only the conditions to be met, but also the characteristics of the breed, must be considered, to make the wisest selection. The five breeds mentioned above are described and discussed at length in Farmers' Bulletin 893, "Breeds of Dairy Cattle," which can be obtained by writing to the Department of Agriculture, Washington, D. C.

ADVANTAGES OF COMMUNITY BREEDING.

It is well to have an intelligent knowledge of the adaptability of various breeds, yet it is often best to be governed by the prevailing conditions in the locality. The predominance of a certain breed in a community offers many advantages. A market is established which, because of the availability of large numbers of animals, attracts buyers from a distance, especially those who buy in carload lots. Under such circumstances, all surplus stock can be disposed of to better advantage, and cooperative advertising may be used effectively. Any necessary additions to a herd can be obtained, without the expense of travel, from neighbors' herds with whose history the buyer is thoroughly familiar.

A still greater advantage from having one uniform breed in a community is that obtained through the formation of cooperative bull associations, the workings and benefits of which are fully described in Farmers' Bulletin 993, which also may be had on application to the Department of Agriculture. This plan gives all the members of an association in a community the services of a pure-bred and high-quality bull at small individual expense, without inbreeding.

The ideal bull association is of a size to permit the purchase of about five pure-bred bulls, sufficient for between 300 and 400 cows. The association is divided into geographical blocks and one bull is kept in each block by a member designated by the directors of the association, who is paid for his trouble. Expenses are prorated. At the end of two years, when the first generation of heifers is ready to breed, the bulls are shifted in rotation, so that each bull may be kept 10 years without inbreeding. If any of the breeding bulls prove disappointing in their performance, they are sold by the association and replaced with better ones, while all members share in the benefits from the good bulls. Records of the Department of Agriculture show definite and surprising results in increased production where bull associations have been in operation a few years.

DISCARD THE UNPROFITABLE COWS.

The bull association offers a means of building up a herd along practical lines; the cow-testing association goes hand in hand with it to promote efficiency in production. When milk is delivered to the cheese factory or creamery, the scales tell how much the herd has produced, and the Babcock tests tells its value in butter fat. If the farmer keeps ordinarily accurate records, he knows what his herd has cost for maintenance. But there may be cows in the herd that are laggards—consuming large quantities of feed without giving profitable returns. It is possible for the individual farmer to single these out, but it requires equipment which might be used for an entire community; and what is more significant, it requires such an amount of careful record keeping that few farmers are willing to do it by themselves.

A cow-testing association, consisting of about 26 members, one for each working day in the month, employs a competent tester, who makes the rounds, weighing the milk at the night and morning milkings, testing it for butter fat, and weighing or estimating the feed. With supplemental information about the cows, he is able to give the farmer a rough estimate of each individual cow's efficiency on the first visit, and cumulative figures will point out surely the cows which are paying for their keep and those which might better be disposed of.

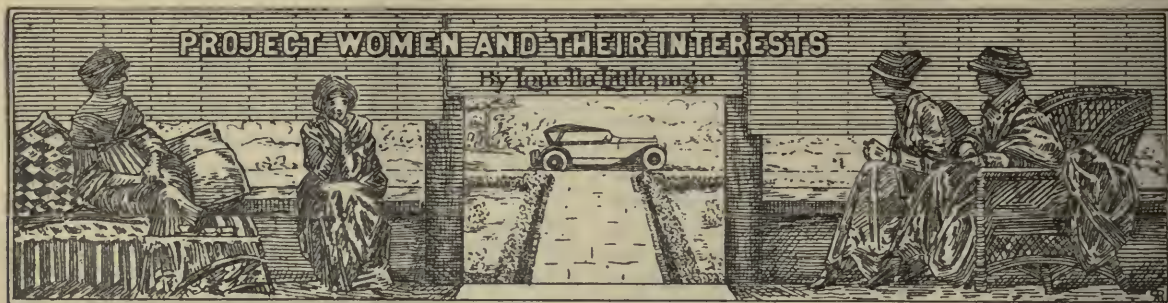
The department has the record of one farmer who by means of this information was able to reduce a herd of 31 cows to 20, and by feeding each cow according to her individual production, to obtain better results from the 20 than from the 31. This case is by no means unique. In fact, there are many similar instances.

DAIRYING MAINTAINS FARM FERTILITY.

Dairying is a business of increasing promise with reclamation farmers. It dovetails with many crop industries, such as sugar-beet raising; it goes hand in hand with the raising of swine for the market; and it is one of the surest ways of keeping up the fertility of the farm. But whoever engages in it must do so with intelligence and perseverance to make a success.

The Department of Agriculture is doing effective work in helping farmers to build up this industry, and farmers will do well to avail themselves of its services. This can be done by communicating with the county agent, with the State experiment station, or direct with the Dairy Division, United States Department of Agriculture, Washington, D. C.

A manure spreader not only saves labor, but enables you to cover a greater acreage with the same amount of manure. Frequent light applications to many fields keep the whole farm productive.



THERE are times when the "Glad" game seems a bit overrated, but with Armistice Day, and Thanksgiving Day, and turkey 'n everything all in one month, it shouldn't be hard to "play the game" in November. What if late frosts did get the fruit crop, or potatoes didn't pay for digging, or several other things did go wrong? Remember the dough-boy, whose first words after losing a leg in the Argonne were "Thank Heaven it was the leg with the rheumatism!"

But judging from reports of State and county fairs project people have something to be really thankful for this year. A traveler recently returned from the West avers that a ride through any of our projects is an exposition in itself, as inspiring and astonishing as the "close-ups" under the big tents; that the prosperous modern homes, thrifty young orchards, up-to-date poultry farms, great stacks of alfalfa, and silos marking pure-bred dairy and stock farms would be an eye opener to Easterners unacquainted with irrigation and its results. He enthused on the live stock—the horses with lovely sleek heads and slender ankles, the pure-bred cattle and pedigreed hogs.

Fortunately our official photographer was in Powell during the Northwestern Wyoming State Fair and took several views, among which are the two illustrations on the next page. Undoubtedly this show was a counterpart of scenes being enacted in or near all the projects. The crocheted counterpanes, exquisitely pieced quilts, and wonderful bits of embroidery bring a homesick lump in my throat.

But to go back to the "glad" game—there are some proud boys and girls and some prouder parents on the Shoshone project, for the club boys and girls of Powell accomplished a great feat at the Wyoming State Fair at Douglas, which, it is claimed, has never before been equaled in the history of boys' and girls' club work.

The canning team, consisting of Thelma Edmunds, Hazel Hawley, and Christina Kohlmeier, defeated all competitors and became State champion. As Wyoming State champions the Powell team will get a free trip of a week, with all expenses paid, to Denver in January to meet the champion teams from seven other States.

The stock judging team also became State champions in their line. Two of Powell's boys tied for first place, while the third place was given to another Powell boy. This team, Donald Northup, Winn Clark, and Gordon Loomis, will also get the free trip to Denver.

Further than this the Powell Potato Club took all the prizes for potato club boys and girls at the State fair. The potato club has been State champion and "One-hundred per cent Club" for the past two years. A 100 per cent club is one in which every member has finished the work.

Club members also entered seven registered Duroc gilt pigs at the 1921 Northwestern Wyoming State Fair. Stanley Krepps, whose exhibit took first prize, has a pig under six months old weighing 190 pounds. This pig was taken to the Midland Empire Fair at Billings, Mont.

No wonder the Shoshone project people are proud.

Uncompahgre Boy Won State Championship.

The Delta team of the Boys' and Girls' Clubs came near not getting to the Colorado State Fair this year, but when it finally did arrive it carried off first honors in the stock-judging contest. The Delta team is headed by Burton Sieley, a 16-year-old boy. When time for the fair approached the county commissioners refused to furnish money to send the team to Pueblo, but Sieley refused to accept their edict, and through sheer weight of good argument brought the commissioners around to the point where they signed the check for the expense money, and the Delta boys and girls started for the fair. The team not only won first place in stock judging, but young Sieley won the State championship.

Montrose County made a killing at the State Fair at Pueblo, winning 38 first prizes, 31 second prizes, 8 thirds, 1 fourth, and 4 fifth prizes. The fruit exhibit won 6 first, 12 seconds, 5 thirds, and 3 fourths. The two largest pumpkins at the fair were from Montrose County, one weighing 79 and the other 82 pounds. A squash weighing 80 pounds was also seen.

The Montrose canning team got third place at the State Fair; the stock-judging team took fifth place, while Orville Dunlap took third place as individual

in the State stock-judging contest out of 42 competing. He scored 100 per cent in the dairy class, being high man.

Up on the Yakima project, Washington, Onolee Starcher, 7 years old, was competing with men of much experience in raising farm truck. The little girl, daughter of C. C. Starcher, of Fairview, entered some "Spanish red" peanuts in the general agricultural class instead of taking them to the children's department. Her plants are so perfect that it was reported no one doubted but that she would get a prize. She obtained her seed from an uncle, who is a Government agriculturist on duty in Alabama. Though the Spanish red peanuts are smaller than the goobers which used to sell at a nickle a sack, they are used almost exclusively for salted peanuts and peanut butter.

To answer Eve's question at the Yakima fair, a demonstration at the auditorium was put on, using some of the cities' charming young misses as models, with the cooperation of Yakima merchants, local teachers, and home demonstration agents from Seattle.

"What to wear" has been the eternal feminine problem ever since Eve decided that the fig leaf had to go, and it is said that this exhibit settled the question for the present season at least. Beautiful materials and various garments were displayed, and the High School girls of this up-to-date section showed that dressing in a practical, sensible manner does not mean sacrificing style and smartness.

What to do and what not to do in setting the table was also shown in the Woman's Building.

Can the Yakima project grow sunflowers? "Oh, boy!" said Harold Predock, "Look what I found among my rows." One look at the long stalks and one involuntarily began figuring how many it would take to fill a silo. One stalk was 14 feet long and surmounted by a perfect head of seed which would furnish several meals for a sizeable flock of chickens.

The Zillah exhibit in the horticultural building was the only one to remind the fair visitors that this was the silver anniversary of the Washington State fair. While the Yakima project towns all did themselves proud, Zillah had the largest display of any district exhibitor in the building. It had a booth of vegetables,



EXHIBIT BY
BOYS' AND GIRLS'
GARDEN CLUBS
NEEDLEWORK
AND
ALLIED ARTS.

NORTHWESTERN
WYOMING
STATE FAIR,
POWELL,
WYOMING.
SEPTEMBER 13 - 16,
1921.



a table of 240 plates of apples—red-cheeked, golden, and green—another table of 50 plates of grapes, and the anniversary exhibit showing the silver cups won by Zillah growers at the Spokane, Minneapolis, and New York apple shows. Even the two trains which run through the town were represented by toy trains which ran around the table on a silver track. In the center was a wax figure of a woman typifying Zillah, with a large peach in her hand. The director explained that Zillah says it with peaches instead of flowers.

A New Club.

The project women's clubs have another new club to welcome to their circle in the Arpan Woman's Club, South Dakota, organized about two months ago. They started with 14 members, but are ambitious to make up in good works for what they lack in size, and 14 members isn't so small at that. At their first meeting they planned certain community improvements, and for their own advancement they started in immediately making dress forms.

A charming letter from their president informs us that they will appreciate any information about club work and suggestions for suitable songs for the club.

Their success is a foregone conclusion. Any club that sings at its work is bound to win, for clubs are much like individuals in their makeup.

To Beautify Their Town.

At a "paving" meeting at Las Cruces, Rio Grande project, New Mexico, recently, Mr. George Frengers made a suggestion which is receiving favorable comment by the local press and, it is hoped, by the citizens at large. He proposed that Alameda Avenue be paved and parked as the opening chapter in developing Las Cruces into the beautiful town it should be with all the natural advantages at its command.

Mr. Grengers proposed that each side of the avenue be paved and in the center a place left in which pecan trees can be planted throughout the length of the street. While these trees are slow growing, nevertheless in a few years they would attain a size which would make fine shade and be highly ornamental and useful as well. The visitor coming from the north who drove into Las Cruces through a vista such as this would present would have impressed on his mind a picture to make him remember the town for many years. Las Cruces Avenue, too, being of wide proportions, he suggested, will lend itself readily to the same landscaping, and there are other streets in the city which could and should be beautified with trees.

Beauty, when it does not interfere too much with utility, is as much an asset to a town as are concrete walks and streets. Washington, conceded by

many people to be one of the most beautiful cities in the world, counts among its most valuable assets the thousands of fine trees which border practically every street. Consult the local nurseries and the Forestry Bureau, Department of Agriculture, this city, as to ways and means.

Maturity Tests for School Children.

Some of the project schools are this year trying for the first time the efficacy of the maturity test. It was devised by educational experts, and follows somewhat the lines of the Army intelligence tests. Their purpose is to single out and classify children according to their "mental ages." By this method children are graded as deficient, dull, normal, superior, and very superior. The deficient youngsters are given additional care and attention in special rooms where they receive what amounts to almost individual instruction. Dull children, when discovered through the tests, are not demoted. Instead they are given special attention in the hope that they may recover some of the standing which they have seemingly lost. Normal pupils are those who, without additional coaching, will go through the school system at the usual rate, while the superior ones may be able to make more rapid progress than the typical child on whom the school and its promotional system are based.

Maturity tests are not devised to find out how much a child knows but to see whether or not a child is mature enough mentally to tackle certain grades of work.

Parents where the system has been tried are reported to be delighted with results. If your State normal school can not assist you, write to the Bureau of Education, Interior Department, Washington, D. C., for information.

Three Boys and a Garden.

With every newspaper bristling with statistics showing the result of boys' and girls' club work, a youngster has to hustle these days to get special notice, so when Vernon, Guy, and Wesley Hummel, young school boys of Montrose, Colo., were given half a column in the press we realized that the Uncompahgre project had scored another point.

It seems that the Hummel residence has a city block all to itself and the boys were given a good portion of this space for a garden. It was the boys' first attempt at handling adobe, but they were out to win and they certainly did show some of the farmers what could be done with adobe soil plus some brains and energy.

These boys grew and sold over \$200 worth of vegetables; at the time the reporter took a look at their garden they still had additional vegetables worth over

\$50 on hand. They started out the first day they had vegetables to market early last spring and sold \$14 worth of lettuce and radishes. Two days later they sold \$11 worth, and so it went all summer. As fast as a new vegetable was ready it sold, and they were busy all summer working that adobe soil and marketing their produce.

In addition to what they sold and still have on hand, the family reveled in fresh vegetables all summer, so that it is conservative to estimate that they grew over \$300 worth on that little patch of adobe.

Good work! It would have deserved mention had it been carried on by an expert, but for three boys in the grades it can't be beat.

Children Daily Salute Flag.

A pleasing feature of the Central School work, Montrose, Uncompahgre project, Colorado, is the daily flag salute by 700 pupils enrolled there. Every morning when the first bell rings the flag is raised and the pupils salute. They stand thus while the second bell rings, and then march to their respective rooms.

This is a mighty fine feature with which to open the day's work. It teaches the foreign children patriotism and respect for the flag as well as American children, who are all too often careless in their ignorance of what the flag stands for.

Fresh Raspberries in October.

Mr. William Gordon, mail carrier in Montrose, Uncompahgre project, Colorado, has harvested over 150 crates of beautiful red raspberries from his little city garden this season. They are of the Everbearing variety, and unless the frost beats him to it he will gather many more this fall. It might pay to put in some Everbearing berries of various kinds in your own garden.

Model Rural School Building.

The McKinley school building in the rural Toppenish district, Yakima project, Washington, just completed, is a \$20,000 structure of dark red brick, with stucco trimmings. It is one story, 50 by 160 feet, modern in every respect, having running water from a deep well in the building, electric lights, and steam heat.

The interior is divided into four classrooms sufficiently large to care for 300 pupils. Two of the rooms are separated by folding doors that they may be thrown together, thus giving a large assembly hall. There are three teachers.

The school is situated 4 miles from Toppenish, and is one of the show places of the community. It is giving the children of the rural families every advantage enjoyed by pupils in the city schools.

Thanksgiving the Year 'Round.

A woman who has a genuine faith in Providence keeps what she calls her "thank offering box." Into this goes, through the year, from one Thanksgiving to the middle of the following November, a sum of money for every special joy.

These offerings are not confined to her own joys, but each time some member of her family bobs up from some threatened woe, into the box goes the money offering of thanks.

Now the amount given varies, and is rarely a large sum, for the woman is far from rich, but every time she opens the "Thanks" box in November she is surprised to find what a lot of blessings she really has had, for the sum is considerable.

This money is always devoted to giving some one a happy Thanksgiving Day. It doesn't always go into the regular channels. As the woman says, the poor and hospitals are usually fairly well provided for, especially at the holiday season.

Sometimes a homesick girl in a strange city is given fare for transportation home for the Thanksgiving gathering she otherwise would miss. Once a music lover was given a season ticket to the symphony concerts. Again a doctor's bill that had worried a young stenographer who had her mother to support was paid.

In speaking of her pretty custom the owner of the "Thanks" box said "Never did I know what thankfulness really meant until I started my box and saw the joy my thankfulness brought to others."

Getting Coin for Clubs.

A VEGETABLE STEW.

"Oh, won't you appear at our vegetable stew? We'll promise you fun ere the evening is through; Pretend you're a cabbage, potato, or bean, Or any old vegetable you ever have seen. Some pennies, or nickels, or quarters you'll need, For our club, like the vegetables, has to have 'seed.'"

A dozen giant pumpkins set down in a November cornfield lighted by a harvest moon and a myriad of Jack-o'-lanterns greeted us in the big barn where this party was held. Upon closer inspection the huge pumpkins proved to be real booths in disguise. In each case a big wagon umbrella had been set up firmly, and from the top strips of woven wire had been extended outward and downward to the floor to make a curved framework. Lengths of orange cheesecloth were then sewed together to form the pumpkin rind, and gathered at the top around the umbrella ferrule, which in turn was covered with green to represent the pumpkin stem. To it were wired two or three green leaves cut from paper. The front of each booth had been left open, the orange curtains parted to show a table upon which various wares were displayed.

The attendants all wore white, topped off with little green paper caps, out of which wire handles stuck up straight to simulate jack-o'-lantern covers. The floor was strewn with corn husks and cornstalks filled corners and bare spaces. Up in a far corner shone the harvest moon, a big circle of orange tissue paper stretched over a barrel hoop hung in front of a strong electric light.

The usual products of a bazaar were on sale in enticing form in various booths. One pumpkin booth which stood off by itself was labeled "The House of Peter, Peter Pumpkin Eater." Instead of a counter it had covering the entrance a complete curtain, terrifying in its resemblance to a jack-o'-lantern's face. Peter himself stood outside the door, occasionally jangling a cowbell and between times chanting

"Peter, Peter, Pumpkin Eater,
Had a wife and couldn't keep her,
Put her in a pumpkin shell
Where she ate—Oh, it was swell."

The back of this booth was the door to another room in which refreshments could be had.

Near by Peter's house stood a wigwam of cornstalks where an Indian girl sold baby pumpkins whose orange crêpe paper shells covered 2-inch balls of cotton batting concealing surprising little "grabs."

A pie man with a big tray circulated among the guests, hawking little saucer pumpkin pies at a nickel each.

But the entertainment was furnished by the amusing costumes. These were made of crêpe paper, cheesecloth, and gay rag-bag contents, and when the barn was full of jolly, giggling radishes, turnips, corn, peas, potatoes, tomatoes, etc., every one, regardless of age, found themselves indulging in happy, foolish antics, which at once assured the success of the "party." Barrels, boxes, upside-down pails, and sawhorses provided the seats.

The first thing on the program was to prepare the "stew." Suddenly a typical cornfield scarecrow appeared and, flopping its arms, declared it wanted to speak to the crows. Then three "crows" seated themselves by his side on a saw horse. The scarecrow then called for certain vegetables to pair off, naming them at random—as Swiss chard and peas, romaine and radish, etc. The partners formed in line as named and the grand march begins, a review before the crows, who acted as judges and awarded prizes for the most original costume, etc.

The first couple must be tipped off as leaders, and after all have passed before the judges they must form a circle. As long as the cook, with a long wooden spoon, stirs, the vegetables revolve. When she stops stirring and pronounces the stew "done," the fun is on.

A little music adds to the entertainment, and either dancing or games—"Oats, Peas, Beans, and Barley

grow," "Farmer in the Dell," or other old-fashioned games—may be indulged in by all ages, and is preferable to dancing for this kind of an entertainment.

All sorts of attractions will occur to you when you once embark on this kind of a party. The musicians might be dressed as black cats and vary their music with an occasional back-fence yowl. Strings of onions, red peppers, etc., may be used for decorations.

The Government of the United States.

How many readers of the RECORD are familiar with the form of the organization under which our Government operates? The chart on the last page tells the story and should be studied by every citizen of the land. It will be useful, too, in our schools in connection with studies on American government.

Reclamation Record Cook Book.

On the roof of the new Interior Building in Washington there is a cafeteria, established primarily to serve hot lunches to the thousands of clerks in the Interior Department, but incidentally breakfast and dinner are also served every day except Sunday.

Day after day, among other delectable things from the big kitchen, there have issued such pies as most people never dreamed of—flaky, delicate, digestible pastry, filled with the most delightful fruits, or custards, or other compounds. Mingle with the hurrying crowds in the corridors any noon hour and among scraps of conversation you will catch frequent phrases like "This is cherry pie day," or "is this pineapple day?" or "there's lemon custard to-day." And so we were not surprised when different clerks suggested that the RECLAMATION RECORD Cook Book would not be complete without a recipe for making "pies like Nellie bakes," for they are made by a little colored girl, Nellie Randolph, who was raised from a tiny orphan by a farmer down "in ole Virginny."

Nellie never had any cooking lessons—she didn't need them, for she is a born cook—but unfortunately for us she cooks "by pinches and guesses," and as all her pies are made in quantities it has been rather difficult to get definite directions. The following recipe, however, is approximate, and it is well worth your while to experiment in quantities a little in order to evolve such perfect pies as Interior Department employees may enjoy for 10 cents for a LARGE piece:

PINEAPPLE PIE.

Pastry.—With a heaping cup of flour sift a pinch of salt. Quickly work into this a cup of lard or crisco, add sufficient ice water to make the dough soft enough to roll; roll out quickly and place in tin.

Filling.—Cut can of pineapple into small pieces, add cup of sugar, level tablespoonful of corn starch mixed smooth with some of the pineapple juice, and the beaten yolk of an egg. Stir this in the top of a double boiler until it is cooked smooth, then put into pan and bake, using top crust as for apple pie.—L. L.



INTERNATIONAL JOINT COMMISSION INTERPRETS TREATY AFFECTING MILK RIVER IRRIGATION PROJECT.

ON October 4, 1921, at Ottawa, Canada, the International Joint Commission handed down a unanimous decision interpreting Article VI of the treaty of January 11, 1909 (36 Stat., 2451), between the United States and Great Britain, relative to the measurement and apportionment of the waters of the St. Mary and Milk Rivers and their tributaries in the State of Montana and the Provinces of Alberta and Saskatchewan. The questions involved affect the water supply of the Milk River Federal irrigation project in Montana, and were argued before the Commission at St. Paul, Minn., in 1915, at Detroit, Mich., in 1917, and at Ottawa, Canada, in 1920. The text of the decision follows:

Whereas by Article VI of the treaty entered into between the United States of America and His Majesty, the King of the United Kingdom of Great Britain and Ireland and of the British Dominions beyond the Seas, Emperor of India, signed at Washington on the 11th of January, 1909, it is provided as follows:

The High Contracting Parties agree that the St. Mary and Milk Rivers and their tributaries (in the State of Montana and the Provinces of Alberta and Saskatchewan) are to be treated as one stream for the purposes of irrigation and power, and the waters thereof shall be apportioned equally between the two countries, but in making such equal apportionment more than half may be taken from one river and less than half from the other by either country so as to afford a more beneficial use to each. It is further agreed that in the division of such waters during the irrigation season, between the 1st of April and 31st of October, inclusive, annually, the United States is entitled to a prior appropriation of 500 cubic feet per second of the waters of the Milk River, or so much of such amount as constitutes three-fourths of its natural flow; and that Canada is entitled to a prior appropriation of 500 cubic feet per second of the flow of St. Mary River, or so much of such amount as constitutes three-fourths of its natural flow.

The channel of the Milk River in Canada may be used at the convenience of the United States for the conveyance, while passing through Canadian territory, of waters diverted from the St. Mary River. The provisions of Article II of this treaty shall apply to any injury resulting to property in Canada from the conveyance of such waters through the Milk River.

The measurement and apportionment of the water to be used by each country shall from time to time be made jointly by the properly constituted reclamation officers of the United States and the properly constituted irrigation officers of His Majesty under the direction of the International Joint Commission.

And whereas the said reclamation and irrigation officers have been unable to agree as to the manner in which the waters mentioned in the said Article VI should be measured and apportioned;

And whereas, before giving directions as to the measurement and apportionment of the said waters, the International Joint Commission deemed it proper to hear such representations and suggestions thereon as the Governments of the United States and Canada, the Provinces of Alberta and Saskatchewan, and the State of Montana, and as corporations and persons interested might see fit to make, and for such purposes sittings of the commission were held at the following times and places: At the city of St. Paul, in the State of Minnesota, on the 24th, 25th, 26th, 27th, and 28th days of May, 1915; at the city of Detroit, in the State of Michigan, on the 15th, 16th, and 17th days of May, 1917; at the city of Ottawa, in the Province of Ontario, on the 3d, 4th, and 5th days of May, 1920; at the village of Chinook, in the State of Montana, on the 15th day of September, 1921; and at the city of Lethbridge, in the Province of Alberta, on the 17th day of September, 1921, when counsel and representatives of the said Governments, corporations, and persons appeared and presented their views;

And whereas pending final decision as to the proper method of measuring and apportioning said waters interim orders with reference thereto have been made by the International Joint Commission from time to time, the last of such orders bearing the date of 6th day of April, 1921;

And whereas the members of the International Joint Commission have unanimously determined that the said reclamation and irrigation officers should be guided in the measurement and apportionment of said waters by the directions and instructions hereinafter set forth;

It is therefore ordered and directed by the commission, in pursuance of the powers conferred by the said Article VI of the said treaty, that the reclamation and irrigation officers of the United States and Canada shall, until this order is varied, modified, or withdrawn by the commission, make jointly the measurement and apportionment of the water to be used by the United States and Canada in accordance with the following rules:

I. (a) During the irrigation season when the natural flow of the St. Mary River at the point where it crosses the international boundary is six hundred and sixty-six (666) cubic feet per second or less, Canada shall be entitled to three-fourths and the United States to one-fourth of such flow.

(b) During the irrigation season when the natural flow of the St. Mary River at the point where it crosses the international boundary is more than six hundred and sixty-six (666) cubic feet per second

Canada shall be entitled to a prior appropriation of five hundred (500) cubic feet per second, and the excess over six hundred and sixty-six (666) cubic feet per second shall be divided equally between the two countries.

(c) During the nonirrigation season the natural flow of the St. Mary River at the point where it crosses the international boundary shall be divided equally between the two countries.

II. (a) During the irrigation season when the natural flow of the Milk River at the point where it crosses the international boundary for the last time (commonly and hereafter called the Eastern Crossing) is six hundred and sixty-six (666) cubic feet per second or less, the United States shall be entitled to three-fourths and Canada to one-fourth of such natural flow.

(b) During the irrigation season when the natural flow of the Milk River at the Eastern Crossing is more than six hundred and sixty-six (666) cubic feet per second, the United States shall be entitled to a prior appropriation of five hundred (500) cubic feet per second, and the excess over six hundred and sixty-six (666) cubic feet per second shall be divided equally between the two countries.

(c) During the nonirrigation season the natural flow of the Milk River at the Eastern Crossing shall be divided equally between the two countries.

III. The natural flow of the Eastern (otherwise known as the Saskatchewan or Northern) tributaries of the Milk River at the points where they cross the international boundary shall be divided equally between the two countries.

IV. Each country shall be apportioned such waters of the said rivers and of any tributaries thereof as rise in that country but do not naturally flow across the international boundary.

V. For the purpose of carrying out the apportionment directed in paragraphs I, II, and III hereof the said reclamation and irrigation officers shall jointly take steps—

(a) To ascertain and keep a daily record of the natural flow of the St. Mary River at the international boundary, of the Milk River at the Eastern Crossing, and of the eastern tributaries of the Milk River at the international boundary by measurement in each case:

(1) At the gauging station at the international boundary.

(2) At all places where any of the waters which would naturally flow across the international boundary at that particular point are diverted in either country prior to such crossing.

(3) At all places where any of the waters which would naturally flow across the international boundary at that particular point are stored, or the natural flow thereof increased or decreased prior to such crossing.

(b) To fix the amount of water to which each country is entitled in each case by applying the directions contained in paragraphs 1, 2, and 3 hereof to the total amount of the natural flow so ascertained in each case.

(c) To communicate the amount so fixed to all parties interested so that the apportionment of the said waters may be fully carried out by both countries in accordance with the said directions.

VI. Each country may receive its share of the said waters as so fixed at such point or points as it may desire. A gauging station shall be established and maintained by the reclamation or irrigation officers of the country in which any diversion, storage, increase,

or decrease of the natural flow shall be made at every point where such diversion, storage, increase, or decrease takes place.

VII. International gauging stations shall be maintained at the following points:

St. Mary River near international boundary; the North Branch of Milk River near international boundary; the South Branch of Milk River near international boundary; Milk River at Eastern Crossing; Lodge Creek, Battle Creek, and Frenchman River, near international boundary; and gauging stations shall be established and maintained at such other points as the commission may from time to time approve.

VIII. The said reclamation and irrigation officers are hereby further authorized and directed:

(a) To make such additional measurements and to take such further and other steps as may be necessary or advisable in order to insure the apportionment of the said waters in accordance with the directions herein set forth.

(b) To operate the irrigation works of either country in such a manner as to facilitate the use by the other country of its share of the said waters and subject hereto to secure to the two countries the greatest beneficial use thereof.

(c) To report to the commission the measurements made at all international and other gauging stations established pursuant to this order.

IX. In the event of any disagreement in respect to any matter or thing to be done under this order the said reclamation and irrigation officers shall report to the commission, setting forth fully the points of difference and the facts relating thereto.

X. The said order of the commission, dated the 6th day of April, 1921, is hereby withdrawn, except with respect to the report to be furnished to the commission thereunder.

On October 6, 1921, at Ottawa, Canada, the International Joint Commission unanimously made the following recommendations relative to storage of the waters referred to in the above decision, to wit:

The commission finds, as the result of a very thorough investigation of the possibilities of irrigation development in those portions of the State of Montana and the Provinces of Alberta and Saskatchewan capable of irrigation by the waters of the St. Mary and Milk Rivers and their tributaries, that the quantities of land in this international region susceptible of development far exceed the capacity of the rivers in question even under the most exhaustive system of conservation. It is therefore of the utmost importance, not only because of the practical benefits to accrue to the people of this western country, but still more because the St. Mary and Milk Rivers problem is one that might easily become a source of serious irritation and misunderstanding to the people of the two countries, that every effort should be made to obtain the maximum efficiency in irrigation from these waters.

In the First Annual Report of the United States Reclamation Service, 1902, a project was outlined for the storage of 250,000 acre-feet of water, by means of a dam across the outlet of the St. Mary Lakes.

And further the United States Reclamation Service has already constructed a reservoir at Sherburne Lake, and the Commission is informed that said service has in contemplation the construction of what is known as the Chain-of-Lakes reservoir in the valley of the Milk River after that stream leaves Canada; and

that the Reclamation Service of Canada has in contemplation the construction of what is called the Verdigris Coulee reservoir on the northern side of the Milk River.

The commission is strongly of the opinion that the construction of said St. Mary Lakes, Chain-of-Lakes and Verdigris Coulee reservoirs, and the operation of all reservoirs under its direction, will make it possible to conserve practically the entire winter flow and flood waters of the two streams and insure the greatest beneficial use of the same to both countries. Because of the international interests involved and as a means of furthering those relations of neighborliness and good fellowship which it is convinced the people of both countries have earnestly at heart, the commission believes that the cost of construction of the works at the outlet of St. Mary Lakes should not be charged against any particular project but should be borne jointly by the Governments of the United States and Canada; the legal title of said reservoir to be vested in the United States.

It is therefore ordered that the following recommendations be respectfully submitted to the Governments of the United States and Canada:

"That the Governments of the United States and Canada enter into an agreement for the construction of a reservoir at St. Mary Lakes in Montana.

That the Reclamation Service of the United States proceed with the construction of the proposed Chain-of-Lakes Reservoir in Montana, and the Canadian Reclamation Service with the proposed Verdigris Coulee Reservoir in Alberta.

That all reservoirs herein mentioned be constructed, controlled and operated in the manner, for the purpose and subject to the conditions above set forth.

Wyoming-Colorado Water-Right Case to Be Re-argued.

On January 11, 1918, the case in equity brought by the State of Wyoming against the State of Colorado to enjoin a diversion of water from the Laramie River, an innavigable interstate stream rising in Colorado and flowing into Wyoming, was submitted to the United States Supreme Court. No decision was rendered and that court has now ordered a reargument of the case, which has been set for January 3, 1922.

In this action, the State of Wyoming seeks to uphold the claims of certain of its citizens to water rights from the Laramie River under the doctrine of prior appropriation without reference to State lines, while the State of Colorado contends that the right to the use of all the waters within its boundaries belongs to the State and its people, and that the claims of its citizens thereto are in no way subject to earlier diversions made in another State. The Government intervened in the case at the suggestion of the court, and asserts that all of the rights to the use of water in the arid region secured in accordance with local laws and customs come by Government grant alone under the act of 1866 and subsequent acts, State legislation upon the subject being a mere instrumentality for carrying out the purposes of those acts, that the rights to the use of all the water of the

innavigable streams of that region yet unappropriated still remain in the United States, wholly free from State control, and that the rights of prior appropriators are not effected by State lines.

Damages from Government Automobiles.

On January 10, 1921, a special agent of the General Land Office, operating a Government-owned automobile, collided with a building in Riverside, Calif., owned by the estate of G. D. Cunningham. The collision occurred because of a defect in the automobile that made the machine unmanageable. The driver, assuming that the Government was responsible for the damage, directed the Cresmer Manufacturing Co. to make repairs. This was done at a cost of \$210 and claim for that amount was rendered by the company to the United States. On October 1, 1921, the Comptroller General denied the claim on the ground that it was based upon the tort of an agent of the United States. (*Gibbons v. United States*, 8 Wall., 269; *Bighy v. United States*, 188 U. S., 400; 3 Comp. Dec., 374.) The driver of the automobile urged that since the Government paid for the repairs to its own automobile it was equally obligated to pay for the repairs to the private property injured at the same time and through the same cause. The Comptroller General in reply quoted from *Hart v. United States*, 95 U. S., 316, as follows: "A Government may be a loser by the negligence of its officers, but it never becomes bound to others for the consequences of such neglect, unless it be by express agreement to that effect." (Dec. Compt. Gen., Oct. 1, 1921.)

State License Tags for Federal Motor Cycles.

The secretary of state of the State of Colorado presented claim against the United States of \$1.50 for the actual cost of two license tags furnished for two Government motor cycles used in the Rocky Mountain park service in the State of Colorado. The claim was made under section 5b of the Colorado motor-vehicle law, chapter 161, Colorado Session Laws 1919, which provides for the furnishing of such tags to the Federal Government on payment of the actual cost of the tags. The secretary of state contended that Colorado is only exercising its police power in requiring identification tags on motor vehicles owned by the Federal Government and operated on its highways, as a means of fixing the responsibility for damage or misconduct thereon; that the license tag is furnished at actual cost and is a cheap and easily procured mark of identification; and that the State does not insist that the Federal Government purchase its license tags, being satisfied with any proper mark of identification. The Comptroller General of the United States held that the claim of the State of Colorado could not be allowed. (Dec. Compt. Gen., Sept. 20, 1921.)

—Ottamar Hamel.

WHAT IS EXCESSIVE IRRIGATION? ¹

By Dr. John A. Wiltsoe, President University of Utah.

IN brief, excessive irrigation is merely irrigation beyond the needs of profitable agriculture. It must be remembered that water which is placed upon the soil for irrigation purposes disappears in three ways: A part of it escapes into the air by direct evaporation; a second portion, soaked into the soil, is taken up by the plant roots and evaporated at the leaf surfaces; and a third portion moves slowly through the soil and disappears as seepage water. Evaporation is not a serious factor in the excessive use of water, but transpiration and seepage should be controlled and reduced to a minimum. Whenever irrigation is excessive, a needless amount of water is transpired by plants and an unnecessarily large quantity of water lost by seepage through the soil.

SOIL AND WATER.

Water is held as a film around the soil particles and fills the small interstices of the soil mass. Water, applied to the soil in irrigation, first wets the upper particles; then, slowly, as the film thickens around these particles, the lower particles are wetted, and there is a gradual descent of water from the surface into the lower layers of soil. The moister the soil, the more rapid is this descent. Very dry soil does not permit the easy passage of water. This may be illustrated by the common experience of driving, on a dusty road after a rain, through a pile, apparently of mud, which proves to be dry dust inside.

The quantity of water that may be held by soils varies according to many factors not to be discussed here. However, 1 inch of water applied to a loamy soil is equivalent to an increase of 6 per cent of water to the depth of 1 foot of soil. If, then, 8 inches of water are applied, 2 feet of soil will be moistened to the amount of 24 per cent, or approximately all that the soil will hold, without allowing water to descend very rapidly into the lower layers. If the soil contains about 12 per cent of water at the time of irrigation, 8 inches would moisten 4 feet to the degree of saturation. The maximum capacity of soil for moisture varies a great deal with the nature of the soil. A sandy soil will hold approximately 10 to 12 per cent of water in a state of saturation; a loamy soil, as above stated, about 24 per cent; and a clay soil, 40 per cent or more.

UNSATURATED CONDITION OF IRRIGATED SOILS.

It is a cardinal principle in irrigation that irrigated soils should always be unsaturated. It is the un-

saturated condition of soils that makes possible many of the best consequences of irrigation practice. Irrigation should be so practiced that most of the water applied to the soil is held within the reach of the plant roots, that is, within the upper 7 to 10 feet of soil; 85 per cent of the irrigation water applied should be held in the upper 10 feet of soil. This may be done because nature has provided that when water is applied at the top of the soil, the upper layers first become saturated, the lower layers then take on a little less, those lower still a little less, until, if the right amount of water is applied, the major part of the water applied will be found in the upper soil layers, gradually diminishing until there is scarcely any movement of the water applied beyond the depth of 10 feet. This, of course, is not so in gravelly soils or those underlaid with hardpan; I am speaking here of soils of uniform consistency and texture. It is of prime importance for the irrigation farmer to maintain his soil to a depth of 10 feet in an average unsaturated condition.

EFFECTS OF EXCESSIVE TRANSPIRATION.

The proper growth and development of plants require that the plant roots absorb moisture from the soil, carry that moisture through the plant stems into the plant leaves, where it is finally evaporated from the leaf surfaces. The rate of this transpiration may be varied greatly. The factors upon which the rate of transpiration depends are many; a chief one is the quantity of water contained in the soil. The more water there is in the soil, the more water is passed through the plant and evaporated at the plant leaves. Transpiration increases, in short, in proportion to the amount of water found in the soil. In that respect, plants do not have any regulatory apparatus, so far as is known. The farmer can, at will, compel a larger transpiration stream or a smaller one by applying more or less water. This is made still more important from the fact that the growth of the plant does not keep pace with the quantity of water used in transpiration; that is to say, it does not follow because more water is passing through the plant that the crop is growing more rapidly. In fact, careful studies carried over a large period of years have made it clear that the quantity of water used to produce a pound of crop becomes larger and larger the more water is applied to the soils. In other words, the water cost of plants is higher as more water is used. There comes a time at last, if excessive quantities of water are applied, when plant growth almost ceases. The plant becomes merely an apparatus for pumping the excess water from the soil through its own structure

¹From address at 15th Annual Convention of the Western Canada Irrigation Association, published in *The Irrigation Review*, September, 1921.

into the air, and this work consumes the energy of the plant which otherwise should be used in the processes of growth. Every farmer familiar at all with irrigation agriculture has recognized this condition—the stunted yellow plants growing on fields where too much water has been applied.

The first harmful effect of excessive irrigation is, therefore, that the farmer who, at considerable cost, has secured water for irrigation purposes receives less plant substance for the water he uses than if he irrigated more wisely, more economically, and that, in fact, by the persistent and constant misuse of irrigation water, it is possible to make the plant growth so small as to make the whole husbandry unprofitable.

EFFECT OF SEEPAGE.

There is an equally deleterious effect of excessive irrigation upon the soil. Naturally, water dissolves more or less rapidly almost anything with which it comes in contact. Few substances known to man are wholly insoluble in water. The soil constituents are all slowly soluble in water. Continuous leachings occur when water is continually passing through soils. When water is applied excessively in irrigation, large quantities seep steadily through the soil, to be lost, as far as the crop is concerned, and these seepage waters carry with them large quantities of substances dissolved from the soil. These dissolved substances are usually those most easily dissolved and therefore of greatest value to the crop. The losses of nitrogen, potash, phosphoric acid, and other important plant foods are often very considerable, and in that way the soil is robbed of its fertility, which should be used for the production of crops.

Too much water in soil reduces the crop yield, by increased transpiration, and by limiting the plant foods, and can easily be made the primary cause of agricultural failure in irrigated regions.

WATER LOGGING AND ALKALI.

In addition, the waters which seep through the soils as a result of excessive irrigation accumulate, ultimately, in the lower-lying portions of the land, and there evaporate, leaving behind the substances which they hold in solution and which have been taken from the neighboring soils. Thus alkali is formed, which as the concomitant of unwise irrigation, is one of the most serious menaces to the permanency of irrigation agriculture.

HOW MAY EXCESSIVE IRRIGATION BE CORRECTED OR AVOIDED?

First and fundamentally, by a better understanding by farmers of the principles that govern the use of water in irrigation. Few farmers really understand the vital and fundamental principles which are in

operation when water is used by plants or when water passes through the soil. There must be a better knowledge among farmers of the general relationships that exist between plants and soils and water. Then the farmer must govern more carefully the amount of water which he applies each irrigation. He must know how much he uses. In general, when more than 5 inches of water in depth are applied in one irrigation, much water is lost by seepage. If farmers can be made to understand that the quantity of water used does not determine the quantity of crop produced, much of the battle against excessive irrigation will have been won. Almost above all it must be said with emphasis that irrigation is never to take the place of tillage. Irrigated districts are constantly beset with the danger that the farmer believes that by applying water he can escape the labors of hoeing and otherwise tilling the soil. Irrigation can not with success take the place of tillage. Irrigation and tillage, hand in hand, give the best results.

THE NEW DUTY OF WATER.

The phrase *the duty of water* has long been recognized to indicate the value of water in producing crops. In the western part of the United States, where this phrase was coined, it has found its way into the courts of law. Its general meaning is the area of land that a given quantity of water may be made to serve. Thus a duty of 80 acres means that 1 second-foot irrigates 80 acres of land. In the beginning of modern irrigation days, when farmers knew little about the principles of irrigation, and had to apply water to a barren soil to produce crops to protect themselves against starvation, their only thought was to spread water on the soil—much if they had much, little if they had only a little. Later on, when more settlers demanded participation in the benefits of the stream, the term *beneficial use of water* came into vogue. Water should be used for beneficial purposes, agriculturally speaking; that is to say, it should not be wasted or used for ornamental purposes, for power purposes, or for other purposes nonagricultural, because the production of food should be the first consideration. For many years the *beneficial use of water* held the center of the stage. To-day, as our civilization under irrigation has developed and grown, and as we have learned to understand more clearly the great problems involved in the building of irrigation agriculture, we have left behind, in our progressive march, the *beneficial use of water*, and are now teaching everywhere that water should be used *economically*. The *economical use of water* is the one kind of use that should be recognized by the practitioner and by courts of law. The *economical use of water* means that we should use water in such a manner as to obtain from a given quantity of water the greatest

possible quantity of crops profitably. It does not merely mean that water should be applied to produce crops, but water should be applied to produce crops in the largest abundance with the water and the other factors at our command. This is the most recent and probably the most permanent mark of civilization under irrigated conditions. The new duty of water demands that water shall be used economically; and fortunately, through the labors of many experiment stations in America and other parts of the country, we have now a body of natural laws which can be used to guide us in the economical use of water. We know at what point the profitableness of irrigation agriculture ceases, considering all the factors involved. This was not known a few years ago, and therefore the *beneficial* use of water had the first place.

THE SOCIAL VALUE OF IRRIGATION.

There can be no doubt in the minds of those who study the subject that many of the social problems of our day will be solved by a better use of the areas on the surface of the earth with a limited rainfall. Irrigation will be the main factor in reclaiming these areas. A healthful, wholesome civilization always grows up under the irrigation ditch. It is a world need, that this system of civilization shall be made permanent, that nothing shall be done now, when it is being built under modern conditions and with recent information, that will make it temporary in its character, with all the disastrous results that follow a lack of permanency.

THE CAUSE OF HARD LANDS.

By C. S. Scofield, United States Department of Agriculture.

IN NEARLY every irrigated section of the United States there is trouble caused by seepage or high ground water. This trouble shows up first in the lower lands where the excess of water applied in irrigation or that lost by seepage from the canal system accumulates. In view of the fact that all irrigation water carries some salt in solution and that the soils of arid lands are often charged with soluble salts, the common experience is to find that the seepage water which collects in the lower lands is salty, often too salty for use by man or beast.

These salts which are dissolved in the seepage water are of particular interest to the irrigation farmers because of their injurious effect on crops or on the land. If it were not for the salts dissolved in the seepage water the difficulties and losses resulting from seepage would not be very serious. If it were not for these salts which it contains the seepage water could be drained off without much difficulty, and the drained land would be none the worse from having been soaked for a few months or years. In fact, where the ground water is not salty reclaimed swamp land is notably productive. On the other hand, where the ground water is salty the reclaimed swamp land is almost invariably difficult to work into good tilth and often remains unproductive for years after the ground water has been removed by drainage.

It is because of these dissolved salts in the ground water that the drainage of irrigated land is found to be a very different problem from the drainage of swamp land in regions where the ground water contains very little salt. For the dissolved salts have a very pronounced effect on the physical character of the soil. The effects are shown in two ways. One is that the soil is made plastic or "greasy" and holds the water from moving through it freely. On this

account the drainage of salty land requires more time and deeper drains than the drainage of ordinary swamp lands. The second effect is shown when the land becomes dry. When salty land has been drained it rarely becomes soft and easy to work into good tilth, but instead it usually is found to be very hard to work, and even after it has been broken up and put into apparently good tilth the soil particles seem to melt and run together again when it is wetted with rain or irrigation water. Thus it is said to "slick over" or "puddle" instead of taking the water easily.

In some sections of the West it is found that lands that have never been swamped or even irrigated are sometimes hard in places and do not take water well when irrigated. These so-called "slick spots" are, almost certainly, due to the effect of salt on the soil, just as the same effects are now produced by swamping the soil with salty water. Probably these hard spots in raw land are the result of salt accumulations that took place long ago from the evaporation of flood waters collected in low spots.

The cause of the injurious effect of salt on the physical condition of the soils in irrigated regions has not been well understood. It has been well known that an excess of salt, usually called alkali, is injurious to crop plants, and there have been many investigations concerning the effect of these "alkali" salts on plant growth. But much less attention has been given to the effect of the salts on the physical condition of the soil and how to correct or prevent the bad effects which they produce.

It is now clear that the so-called alkali problem on irrigated lands has two distinct phases. One of these has to do with the effect of the salts on plant growth and with the removal of the salt-carrying ground

water by drainage and the other has to do with the effect of the salts on the physical condition of the soil. It has been, too often, the sad experience that the drainage of seeped or salty land has not resulted in immediate improvement. In many places where expensive drains have been put in and the surplus water drawn off the land has remained for years nearly or quite unproductive. Furthermore, the extensive areas of hard lands or "slick spots" that are found in some irrigated sections where there is no complication of seepage have been very troublesome to the farmer and baffling to the investigator.

This subject of hard lands, both as result of seepage injury and as occurring naturally in lands not previously irrigated, has been under investigation for some years at the Newlands Experiment Farm, operated by the United States Department of Agriculture near Fallon, Nev., where there are extensive areas of hard land. These investigations have finally given a clue to the cause of these hard lands, and it is hoped that they may lead to the working out of practicable means of preventing trouble of this sort in the future and also in hastening the improvement of lands already damaged by salt.

In order to deal with this problem of hard lands intelligently it is necessary to understand its cause. There may be several practicable remedies, and if the cause is clearly understood one remedy may be used in one case and another be found better or cheaper in another case.

The salts which cause trouble in irrigated lands are the salts of soda, such as common salt (sodium chloride), Glauber's salt (sodium sulphate), and "black alkali" (sodium carbonate). These salts are all easily dissolved in water and are carried in the water as it moves through the soil or over the surface. But when the water is evaporated from the soil the salt is left behind in the form of fine white crystals, which may be seen on ridges in the fields or along irrigation or drainage ditches just above the water line.

In order to understand the action of these salts of soda on the soil it is necessary to remember that one of the chief constituents of the soil is silica. This silica is united with such elements as aluminum, calcium, magnesium, and iron, in which form it is nearly insoluble in pure water. But when the soil is soaked for a long time in water containing the salts of soda it is found that some of the soda from the solution changes places with some of the aluminum or calcium or magnesium and unites with the silica, while these replaced elements go into solution. The extent to which this exchange takes place between the salts in solution and the soil substance is not very great, but it is easily possible to measure it by analysing a solution of salt before and after it has been in contact with a sample of soil.

The sodium silicate which is formed as a result of this exchange of elements is believed to be the

direct cause of the bad physical condition which results from soaking soil with salty water. Sodium silicate, which is also known as water glass, is a gelatinous or colloidal substance which seems to absorb water rather than to dissolve in it. When it is formed in the soil as a result of the action of salt it acts as a sort of jelly which retards the movement of water through the soil and when the soil dries out this jelly hardens and binds the soil particles together into a solid mass. The action of this sodium silicate in the soil is very much like the action of cement when mixed with sand and gravel. It takes up and holds the water that would otherwise percolate readily through the sand and gravel, and when dried becomes very hard.

This action of soda on the soil is a matter of common experience wherever sodium carbonate or "black alkali" occurs in the soil or in the irrigation water. But it has not been generally recognized that the same puddling action takes place with the other common salts of soda, sodium chloride and sodium sulphate. With these latter salts the puddling effect does not take place while original salt solution is present, but if the salt solution is drained off and replaced with fresh water the soil becomes puddled just as it would if treated with sodium carbonate.

It is natural to ask why, in view of this injurious effect of soda salts on the soil, is it possible to continue irrigation farming, since all irrigation water contains at least a little salt and this would in time accumulate in dangerous quantities. As a matter of fact, many irrigated regions in the old world have been abandoned after a few years or a few centuries and the land once fertile and productive has returned to a desert condition. Even in this country some irrigated lands that were in a high state of production only a generation ago are now abandoned chiefly because the soil has become too hard and impermeable for profitable use. Indeed, there have been well-informed people who have believed that irrigation farming could not be continued indefinitely on the same land because of the deterioration of the soil condition.

On the other hand, it is well known that in some localities, as in Egypt, irrigation has gone on for centuries and profitable production has been maintained. It is not always satisfactory to make comparisons between things which differ in so many particulars as do irrigation projects, but it is possible to suggest, at least, why some irrigated land remains productive and some does not.

In the investigations referred to above which showed that the hardening of the soil was caused by the salts of soda, it was also found that this injurious action did not take place, or is at least much less serious, if lime was present in the water in solution with the soda. It appears that as regards the effect on the soil, lime neutralizes the action of

soda, and that where the water contains as much lime as soda in solution there is little or no injurious action from the soda. This fact has been established experimentally and it is also found that irrigation streams which contain more lime than soda have not given trouble on the land. The Nile, for instance, carries more than twice as much lime as soda, while some of the irrigation streams in this country which have already given serious trouble carry two or three times as much soda as lime.

Unfortunately it is not possible to say that land that has been injured by soda can be reclaimed by an application of lime. Lime in the ordinary available form is not very soluble and it must be in solu-

tion to be effective. It is possible and has been shown experimentally that gypsum or calcium sulphate has a beneficial effect on hard land, but even gypsum is only slightly soluble, about 1 part in 600 parts of water. There is reason for believing that it may be practicable to use other substances more soluble than lime to accomplish the same result. It is known that such substances as iron sulphate and aluminum sulphate, which are readily soluble and not very expensive, are effective in neutralizing the colloidal effect of soda, and experiments are underway to determine the feasibility of using these or other materials in reclaiming hard land.

FILING PERSONAL ENGINEERING DATA.

N. B. Hunt, Office Engineer, Flathead Project, Montana.

THE filing system for personal data described by Mr. Sinclair in the July RECLAMATION RECORD has suggested the following outline of a method devised to accomplish the same purpose. It fulfills the requirements of accessibility, simplicity, and compactness and has been applied successfully for a number of years to quite an accumulation of engineering data.

The file includes working diagrams, drawings, material from technical magazines and pamphlets, and other data preserved for reference. Provision is made for sizes up to 8½ by 11 inches, a limit maintained by folding the sheets if necessary. Pages from technical magazines are trimmed to this size.

The file is divided into three main classes according to the conditions under which the data will be used and their adaptability to certain methods of filing. These classes are:

1. Data subject to brief reference during the progress of calculations or written matter; especially working diagrams and tables.
2. Data requiring study.
3. Data on sheets whose vertical dimensions exceed 11 inches, requiring folding along a horizontal line; especially drawings.

The first class is filed in ring binders. Material is arranged alphabetically by subjects, using one set of index tabs for the series. Binders are numbered consecutively on the back, a method preferable to indicating the letters because of occasional transferring of material from one binder to another to provide for accessions. No effort is required to remember the letters contained in each volume.

Since the success of this method of filing depends to a large extent upon the judicious selection of subjects, an attempt has been made to establish rules governing their use. For some time I kept an alphabetic list of subjects, an adjunct which gradually lost its utility and was discarded. The subjects chosen fall under one or more of the following classes, listed

in what is generally the decreasing order of their importance:

1. Member of structure, structure, or feature; as beam, dam, river.
2. Operation of phenomenon; as excavation, flood.
3. Material or organism (mineral, vegetable, or animal); as concrete, algae (including bacteria), teredo.
4. Generalities, including a variety of subjects not covered by the preceding classes, such as devices, science, properties, localities (for maps), etc., which are further restricted for filing purposes, resulting respectively in terms such as abbreviations, astronomy, permeability, Montana.

A word used for a main subject may also serve as a minor subject. Plant, as a main subject, includes general data on plant and as a subdivision of concrete is limited to plant designed for its handling.

College binders were adopted for the second class. They are more compact than ring binders and it is not important that they lie flat. The data are arranged by subjects of which each binder contains one. Subjects are generally of broader scope than those under class 1 so that binders will be filled to desired capacity, but as data increase the subjects become more restricted and additional binders are required. Material in each binder is generally limited to about one-half inch in thickness to save time in arranging accessions.

With this quantity of data in a binder each subject must be subdivided. Under Concrete the data are arranged in the following order and are accessible without the aid of index tabs, markers, or other devices that complicate the system:

Aggregate.	Plant.
Cement.	Mixing.
Steel.	Forms.
Properties of concrete.	Placing.
Proportioning.	Cost.

If there is no fixed order of operations to suggest the arrangement, alphabetical order may be resorted to as under pipe:

Cast iron.
Concrete :
 Monolithic.
 Precast.
Lead.
Steel :
 Lock bar.
 Riveted.
 Welded.

Wood stave :
 Banded.
 Continuous.
Wrought iron.

These subjects may be subdivided to include cost, fittings, hydraulics, threads, etc.

If an appreciable amount of data is on sheets measuring 6 by 9 inches or thereabouts it may be convenient to use two sets of binders, differing in size. There seems to be little objection, however, to using one binder for at least two successive sizes.

The third class is filed vertically in a drawer and is composed almost entirely of drawings. Subjects are separated by folders and are selected from those used for class 1.

The substitution of ring and college binders for bound volumes of technical magazines effects a saving in space through the elimination of superfluous matter and a saving in time by permitting systematic arrangement. Difficulties arise when separate articles appear on opposite sides of a sheet and such cases represent the only instances of cross-referencing or copying. Unless a very large quantity of data is preserved, however, they will seldom be encountered. Extraneous matter on either side of a sheet is crossed out to aid in locating what is relevant and left-hand pages are reversed by binding along the opposite vertical margin when there is no material of interest on the opposite side.

Ordinary rules for filing can be modified somewhat to promote the practicality of a personal file.

APHORISMS.

An accumulated mass of unfiled data discourages adherence to system.

Subjects chosen at random are not readily recalled.

Data should be filed under name of structure or member of structure whenever practicable.

Special treatment should be given a structure having characteristics not peculiar to the type.

Accessibility is impaired by filing under terms somewhat synonymous, such as road, street, highway; or wood, timber, lumber.

Adjectives are not suitable for main subjects.

The term "Miscellaneous" will lessen the difficulties of filing and multiply those of finding.

The tendency to destroy valuable data is hardly more prevalent than that of filing what will never be used.

Accessibility increases with use.

Reliance on memory is permissible within its limitations.

THE CENSUS OF IRRIGATION.

By R. P. Teele, Special Agent in Charge of Irrigation, Bureau of the Census.

IN the following paragraphs I have attempted to describe the taking of the census of irrigation from start to finish, in the hope that persons interested in the results may be interested in the process also:

The first step in the process was the calling of a conference, by the Director of the Census, to determine what was desired in the way of a census of irrigation by those interested in the subject. This conference was attended by representatives of the various Government bureaus interested and by others not in the public service. After full discussion the conference recommended the legislation providing for the irrigation census, the items to be covered by the inquiries, and the form of the schedule to be used in collecting information.

The enumeration was to begin January 1, 1920, and the actual work of preparation began July 1, 1919. This preparation consisted in printing schedules containing the inquiries that were to be made and instructions to the agents of the Bureau who were to collect the information.

In the 1910 census separate schedules were prepared for the various classes of enterprises, but in 1920 the same form was used for enterprises of all classes.

The plan followed was for the census enumerators who were making the canvass for population and agriculture to make the canvass of all small irrigation enterprises at the same time that they called on the owners for other census information, and for other agents to canvass the larger enterprises later. This canvass began January 2, 1920, and extended well through the summer of 1920.

As schedules were received in the Washington office they were given a preliminary examination to determine whether all pertinent questions had been answered, and in cases in which full information was not given letters were sent to the persons whose names appeared on the schedules, asking them to supply the missing information. As replies were received the information given was entered on the schedules.

The next step was "editing" the schedules. Editing consists in examining each schedule carefully to see that all answers given are consistent and reasonable, in supplying answers not given when this is possible from other answers on the schedule; and in putting on the schedule code numbers indicating in what classes the schedule falls. All data have been classified by the source of the water supply, as streams, wells, etc.; by the drainage basin in which the irrigated land lies; by the character of the enterprise supplying water, as individual, U. S. Reclamation

Service, irrigation district, etc.; and by the date of beginning. Each class in each of these groups was given a number, and the editors placed at designated places on each schedule the numbers indicating the class in which it fell.

All schedules were filed by counties, and when all schedules for a county were in and edited they were numbered for purposes of identification.

In the census of 1920, for the first time, the "punch card" system of tabulation was used. All information given on each schedule was represented by holes punched in a series of cards and in the cards were punched, also, holes indicating the classes in which the enterprise represented by the cards belongs. Seven cards were required for each irrigation enterprise reported. The first card contained all information relating to dams, ditches, pipe lines, and reservoirs; the second, wells and pumping plants; the third, number of farms, acreage irrigated, cost of preparing land, and cost of operation and maintenance; the fourth, capital invested; the fifth, cost of water to farmers; the sixth, the quantity of water used; and the seventh, acreage drained and needing drainage. Each card has punched in it a number representing the State and county and another representing the number of the schedule.

The cards are run through sorting machines which operate by electrical contacts through the holes punched in the cards, and can be set to bring together any group desired—as all cards representing irrigation districts, or cooperative enterprises.

When the cards are sorted by the various classes they are run through tabulating machines, which also operate by electrical contacts through the holes punched in the cards. These tabulating machines add the numbers punched in the cards, and the sums are read off and entered by hand on "result slips," prepared to show all the items classified as desired. All items are tabulated by counties, and the county totals are added to form the State totals, and these are added to form the United States totals.

From the result slips the data are compiled in the form in which they are presented in the reports, and then all the averages and percentages of increase are computed on various kinds of calculating machines. In the whole process none of the adding or computing is done "by hand," all of it being done with tabulating, adding, or calculating machines.

Although much of the work is done by machines, there is ample room for the human element to enter into the results. It is not possible for enumerators to exercise much judgment as to the accuracy of the information given them by the owners of enterprises. Generally speaking, they must take what is given them; there is opportunity for both owners and enumerators to misinterpret inquiries and instructions; clerks may misapply instructions as to edit-

ing; operators of punching machines may make mistakes that verifiers fail to catch; operators of tabulating machines may copy results from the machines incorrectly; and operators of calculating machines may enter numbers in their machines incorrectly and consequently get incorrect results. Every reasonable effort is made to detect and correct errors arising from any of these causes, all results are examined carefully to determine whether they are reasonable and logical, and any that do not seem to be so are traced back to the schedules and to other sources of information to verify or correct them. It is not to be expected that, with such a mass of data passing through so many processes, there will be no errors, but large errors are likely to be detected, and the small ones are likely to offset one another so that the final results come very close to representing the situation correctly.

BUREAU OF THE BUDGET.

Digest of Orders and Circulars.

Circular No. 28, September 1, 1921.—Requests examination and report of purchases and contracts made in June, 1921, to see that contracts and obligations have not been entered into in June for the purpose of leaving no unobligated balance to credit of bureau at the close of the fiscal year.

Circular No. 29, September 2, 1921.—Requests estimate of expenditures during year 1923 "out of unexpended or unobligated balances remaining to your credit from appropriations of previous years of every class except definite annual appropriations," not later than September 5.

Circular No. 30, September 8, 1921.—Specific instructions for arriving at estimate called for in Circular No. 29.

Circular No. 31, September 12, 1921.—Instructing department representative to attend meeting September 16, at which subject of coordination of motor transportation used by departments and independent establishments of Government in the District of Columbia will be discussed, and to be prepared to inform chief coordinator of number of motor vehicles now in use by department.

Circular No. 32, September 13, 1921.—Requiring statements (a) of buildings rented within District of Columbia for use of Government, (b) of Government-owned buildings in District of Columbia, and (c) of employees below fair standard of "efficiency" to accompany annual estimates of appropriations to Bureau of Budget.

Circular No. 33, September 15, 1921.—Calling for survey of all telephone equipment now in use and requesting six regulations re telephone service therein enumerated to be enforced.

Circular No. 34, September 19, 1921.—Rescinding Circular No. 12 in so far as it directed the stopping and suspension of sales of Government property.

Circular No. 35, September 23, 1921.—Requiring the head of each executive department, etc., to name representative in each area in which motor vehicles are in operation, said representative to inform area coordinator of location, kind, and number of all motor transportation, etc., and area coordinator will form plan for coordinating use of motor transport to meet interests of general Government.

Circular No. 36, September 28, 1921.—Designating Col. Clarence O. Sherrill, officer in charge of public buildings and grounds, as coordinator motor transportation, District of Columbia, to carry out provisions of Circular 35.

Circular No. 37, October 4, 1921.—Authorizing the chief coordinator, general supply, to exempt from the operation of Bureau of the Budget Circular No. 7, July 8, 1921, as amended by Circular 13 (par. 3), July 21, 1921, and Circular 18 (par. 3), August 17, 1921, such items as are known not to be in surplus in any department, such items as are obviously impractical of transfer due to distant location of the requiring agency, services required in connection with delivery, public service utilities, etc.; calls attention to the fact that responsibility rests with every department head to insure that every proposed purchase of his department not specifically exempted is forwarded to the general supply.

Circular No. 38, October 7, 1921.—Instructing that if supplemental or deficiency appropriations are actually needed they be transmitted to Director of Bureau of the Budget for his investigation and recommendations before October 20, 1921. Letter of transmission and supporting documents should indicate clearly that there has been no waste in expenditures nor obligations incurred against either the letter or spirit of antideficiency act.

NATIONAL RECLAMATION PLAN ADVOCATED.

The Chamber of Commerce of the United States is committed to advocacy of a national system of reclamation for undeveloped areas, to be initiated through adequate Federal appropriations. It is naming a special committee to study the whole subject, including bills which have been introduced in Congress, and present a report to the board of directors with recommendations. The personnel of the committee so far as it has been appointed is as follows:

E. T. Meredith, Des Moines, Iowa; E. F. Blaine, Seattle, Wash.; Ward M. Burgess, Omaha, Nebr.; Clyde C. Dawson, Denver, Colo.; F. H. Newell, Washington, D. C.; Walter Parker, New Orleans, La.; W. H. Sullivan, Bogalusa, La.; Jos. N. Teal, Portland, Oreg.

EVERY WATER USER NEEDS THE RECLAMATION RECORD.

Dr. John A. Widtsoe, president of the University of Utah, says: "I have learned that where farmers organize they need a printed word or voice which must be accessible to a great many people."

If you know of a neighbor who is not receiving the RECLAMATION RECORD, urge him to send us his name and address in order that he may join the army of RECORD readers, keep in touch with the progress on his own and other projects, and be a more vital force in the community, the State, and the Nation.

The Reclamation Record.

Issued monthly by the Reclamation Service, Department of the Interior, under the authority of the Secretary of the Interior.

Copies of the RECLAMATION RECORD will be sent without direct charge to any water user on our reclamation projects. The subscription price to others is 75 cents a year, payable in advance. Subscriptions may be forwarded to the chief clerk, United States Reclamation Service, Washington, D. C., and remittances (postal money order or New York draft) should be made, payable to the special fiscal agent, United States Reclamation Service. Postage stamps will not be accepted.

Material for publication in the RECLAMATION RECORD should be addressed to *Editor*, United States Reclamation Service, Washington, D. C., and *should be mailed in time to reach the editor not later than the 14th of the month in order to insure publication in the succeeding month's issue of the RECORD.*

HUGH A. BROWN, EDITOR.

SUBSCRIPTION BLANK.

Reclamation Record.

[To be used only by persons who are NOT water users on the projects of the U. S. Reclamation Service.]

_____, 1921.

CHIEF CLERK,

U. S. Reclamation Service,

Washington, D. C.

DEAR SIR: I am NOT a water user on one of the projects of the U. S. Reclamation Service, but wish to receive the RECLAMATION RECORD each month.

I inclose herewith 75 cents for a year's subscription beginning with the current issue.

(Name.)

(Street and number.)

(City and State.)

(Write plainly.)

NOTE.—Send money order or New York draft, made payable to Special Fiscal Agent, United States Reclamation Service. Do NOT send stamps.

EXCAVATING MACHINE OPERATION.

THE attention of all project managers, engineers, and others connected with excavating machine operation is called to the accompanying tables of field costs. They cover practically all types of machines now being used by the service and all classes of work. The cooperation of the projects in the use of the new cost report forms for this work has resulted in more complete and reliable costs than have been previously obtained. However, the method of charging depreciation on plant and equipment is not yet uniform on all the projects. For this and other reasons total unit fields costs have been shown, both with and without plant and equipment charges. In making comparisons, those cases are not considered where depreciation charges appear to be inadequate.

The average for 61 draglines for all classes of work is \$0.117 per cubic yard. For drain excavation the average is \$0.099 per yard and for canal and lateral excavation \$0.128. Comparing these costs with the table published in the RECORD for July, 1921, it is

interesting to note that the unit cost for drain excavation is the same and the cost of canal and lateral work differs by only \$0.002 per yard. The more complete separation of unit costs shown in the July statement was not attempted in the present tables, but will probably be given when the next quarterly statement is published.

The record for drain excavation is held by the Rio Grande project with a Monighan 2-ton (2½ cubic yards) bucket at \$0.061 per yard, with the Bucyrus Class 14 at Yuma a close second at \$0.064.

For straight canal or lateral excavation, a Bucyrus Class 9½ electric has the lowest unit cost at \$0.097 per yard. The lowest price for this class of work with a ½ cubic yard machine is \$0.106, obtained with a Pawling & Harnischfeger machine on the Rio Grande project.

For canal and lateral cleaning work with a ½ cubic yard machine, Milk River and Lower Yellowstone projects have the record so far with costs of \$0.110 per cubic yard each.

EXCAVATING MACHINE OPERATION (FIELD COSTS ONLY) FOR 7 MONTHS ENDING JULY 31, 1921.

RUTH DITCH CLEANERS.

Project.	Machine No.	Number of travel miles cleaning.	Unit cost per mile.	Total cubic yards.	Cubic yards per shift.	Unit cost per cubic yard.		
						Operation.	Plant and equipment.	Total.
Lower Yellowstone.....	32116	5.26	\$128	12,184	406	\$0.035	\$0.020	\$0.055
Milk River.....	32118	3.54	106	(?)	(?)	(?)	(?)	(?)
Yuma.....	32411	25.00	194	37,660	210	.095	.034	.129
Do.....	32112	37.40	223	41,736	175	.153	.047	.200
Do.....	32113	34.80	212	40,130	228	.148	.036	.184
Do.....	32114	36.00	198	42,795	217	.129	.038	.167
Total.....		142.00	203	174,505	213	.126	.037	.163

STEAM SHOVELS.

Project.	Machine No.	Type.	Dipper.	Nature of excavation.	Cubic yards.	Per cent Class 1.	Unit cost.	Total cubic yards.	Cubic yards per shift.	Unit cost per cubic yard.		
										Operation.	Plant and equipment.	Total.
Flathead.....	21127	Bucyrus 38-B.	1½	Pablo Feeder Canal.....	56,860	64	\$0.189	56,860	347	\$0.178	\$0.011	\$0.189
Okanogan.....	21426	Marion 35.....	1½	Canal and road.....	4,150	100	.256	41,335	315	.173	.023	.196
Yakima Storage.....	214210	do.....	1½	Dam embankment.....	37,185	100	.189	31,255	306	.277	0	.227
				Open tunnel cut.....	29,350	?	.187					
				Dam embankment.....	1,905	?	.838					
				Tunnel excavation.....	2,304	?	1.64					
Do.....	21329	Bucyrus 45.....	1½	Open tunnel cut.....	3,541	?	.282	5,845	112	.819	0	.819
Total, all steam shovels.....								135,295	301	.215	.012	.227

Excavating machine operation (field costs only) for 7 months ending July 31, 1921—Continued.

Project.	Machine No.	Excavation and backfill.									Cleaning canals and laterals.		Cleaning drains.		All work of machine.				
		Canals and laterals.			Drains.		Structures and miscellaneous.								Total cubic yards.	Cubic yards per shift.	Unit cost per cubic yard.		
		Cubic yards.	Per cent class 1.	Unit cost.	Cubic yards.	Unit cost.	Cubic yards.	Per cent class 1.	Unit cost.	Cubic yards.	Unit cost.	Cubic yards.	Unit cost.	Operation.			Plant and equipment.	Total.	
BUCYRUS, CLASS 14, GASOLINE DRAGLINE; BUCKET, 1½, 2, 2½ CUBIC YARDS; BOOM, 74-60-51 FEET.																			
Klamath.....	121473	41,853	(?)	\$0.143	.....	.....	4,158	(?)	\$0.397	.....	.....	.....	.....	.....	46,011	422	\$0.088	\$0.078	\$0.166
North Platte.....	121471	87,277	81	.214	.....	.....	1,900	84	.632	.....	.....	.....	.....	.....	89,177	388	.113	.110	.223
Riverton.....	121474	144,662	95	.113	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	144,662	786	.061	.052	.113
Shoshone.....	121475	.....	.....	.....	120,441	\$0.118	.....	.....	.....	.....	.....	.....	.....	.....	120,441	772	.067	.051	.118
Do.....	121472	.....	.....	.....	142,340	.112	.....	.....	.....	.....	.....	.....	.....	.....	142,340	857	.063	.044	.112
Yuma.....	121420	.....	.....	.....	116,025	.064	.....	.....	.....	.....	.....	.....	.....	.....	116,025	779	.042	.022	.064
Total.....	.....	273,792	.....	.150	378,806	.099	6,058	.....	.471	.....	.....	.....	.....	.....	658,656	663	.069	.055	.124

BUCYRUS, CLASS 9½, ELECTRIC DRAGLINE; BUCKET, 1½, 1½ CUBIC YARDS; BOOM, 50 FEET.

Boise.....	13134	.....	.....	.....	20,540	\$0.090	.....	.....	.....	.....	.....	.....	.....	.....	20,640	825	\$0.069	\$0.021	\$0.090
North Platte.....	131312	189,185	69	\$0.100	.....	.....	5,000	85	\$0.120	.....	.....	.....	.....	.....	194,185	582	.070	.030	.100
Do.....	131313	.....	.....	.....	264,542	.092	.....	.....	.....	.....	.....	.....	.....	.....	264,542	721	.063	.029	.092
Do.....	131343	242,299	92	.097	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	242,299	648	.067	.030	.097
Do.....	131345	209,880	69	.105	.....	.....	13,050	100	.100	.....	.....	.....	.....	.....	222,930	586	.074	.030	.104
Do.....	131344	215,950	82	.140	20,287	.110	6,600	95	.171	.....	.....	.....	.....	.....	242,337	646	.068	.070	.138
Total.....	.....	857,314	.....	.110	305,469	.093	24,650	.....	.123	.....	.....	.....	.....	.....	1,187,433	640	.068	.038	.106

BUCYRUS, CLASS 9½, GASOLINE DRAGLINE; BUCKET, 1½ CUBIC YARDS; BOOM, 50 FEET.

Rio Grande.....	121325	53,732	100	\$0.110	86,232	\$0.077	2,168	100	\$0.132	.....	.....	10,484	\$0.106	.....	152,616	549	\$0.061	\$0.030	\$0.091
Do.....	121331	80,847	100	.105	42,545	.104	250	100	.100	.....	.....	.....	.....	.....	123,642	507	.074	.030	.104
Do.....	121332	93,694	100	.117	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	93,694	332	.087	.030	.117
Do.....	121333	66,188	100	.104	163,130	.071	1,500	100	.168	.....	.....	.....	.....	.....	230,818	754	.051	.030	.081
Do.....	121334	15,390	100	.101	230,655	.087	3,800	100	.080	.....	.....	.....	.....	.....	249,845	619	.058	.030	.088
Riverton.....	121322	161,037	31	.173	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	161,037	399	.115	.058	.173
Do.....	121323	142,978	77	.188	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	142,978	354	.125	.063	.188
Shoshone.....	121324	.....	.....	.....	146,178	.105	.....	.....	.....	.....	.....	.....	.....	.....	146,178	585	.074	.031	.105
Total.....	.....	613,866	.....	.144	668,740	.087	7,718	100	.112	.....	.....	10,484	.106	.....	1,300,808	506	.077	.037	.114

BUCYRUS CLASS 9½, STEAM DRAGLINE; BUCKET, 1, 1½ CUBIC YARDS; BOOM 50, 45 FEET.

Shoshone.....	11128	87,005	\$0.128	87,005	446	\$0.106	\$0.022	\$0.128
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BUCYRUS CLASS 30-B, GASOLINE DRAGLINE; BUCKET ¾, 1 CUBIC YARD; BOOM 50, 35 FEET.

Klamath.....	121248	1,515	\$9.170	25,503	\$0.244	27,018	154	\$0.145	\$0.095	\$0.240
Rio Grande.....	121267	62,060	100	\$0.121	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	62,060	285	.073	.048	.121
St. Mary Storage	121249	18,176	100	.177	(1)	.....	.....	.....	.....	.....	.....	.....	.....	.....	18,176	267	.106	.071	.177
Yuma.....	121268	83,800	100	.112	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	83,800	397	.074	.038	.112
Total.....	.....	164,036	100	.123	1,515	.170	.....	.....	.....	.....	.....	25,503	.244	.....	191,054	284	.087	.052	.139

Removal of slides.

MONIGHAN 1-A, GASOLINE DRAGLINE; BUCKET, 1 CUBIC YARD; BOOM, 40 FEET.

Shoshone.....	12426	.....	.....	.....	32,430	\$0.162	.....	.....	.....	.....	.....	.....	.....	.....	32,430	251	\$0.116	\$0.046	\$0.162
Yuma.....	12427	5,500	100	\$0.255	.....	.....	.....	.....	.....	.....	.....	19,115	\$0.104	.....	24,615	277	.083	.055	.138
Do.....	12429	.....	.....	.....	90,635	.088	.....	.....	.....	.....	.....	2,000	.126	.....	92,635	279	.057	.031	.088
Total.....	.....	5,500	100	.255	123,065	.107	.....	.....	.....	.....	.....	21,115	.107	.....	149,680	272	.074	.038	.112

MONIGHAN 1-A, STEAM DRAGLINE; BUCKET ¾, 1 CUBIC YARD; BOOM 50, 40 FEET.

Lower Yellow-stone.....	114215	9,675	\$0.139	9,675	248	\$0.100	\$0.039	\$0.139
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Excavating machine operation (field costs only) for 7 months ending July 31, 1921—Continued.

Project.	Machine No.	Excavation and backfill.									Cleaning canals and laterals.		Cleaning drains.		All work of machine.				
		Canals and laterals.			Drains.		Structures and miscellaneous.								Total cubic yards.	Cubic yards per shift.	Unit cost per cubic yard.		
		Cubic yards.	Per cent class 1.	Unit cost.	Cubic yards.	Unit cost.	Cubic yards.	Per cent class 1.	Unit cost.	Cubic yards.	Unit cost.	Cubic yards.	Unit cost.	Operation.			Plant and equipment.	Total.	
MONIGHAN 2-T, GASOLINE DRAGLINE; BUCKET, 2½ CUBIC YARDS; BOOM, 55 FEET.																			
Rio Grande.....	122349	25,237	100	\$0.113	254,126	\$0.061	3,420	100	\$0.230						282,783	1,198	\$0.038	\$0.030	\$0.068
MONIGHAN 1-T, GASOLINE DRAGLINE; BUCKET, 1 CUBIC YARD; BOOM, 40 AND 45 FEET.																			
Grand Valley...	122238				122,302	\$0.104	2,000	100	\$0.239						124,302	359	\$0.071	\$0.035	\$0.106
Do.....	122227				63,723	.147	3,296	100	.210						67,019	190	.115	.035	.150
Do.....	122228				82,914	.125	1,718	100	.238						84,632	253	.092	.035	.127
Klamath.....	122235	47,490	(?)	\$0.164	48,304	.150									95,794	283	.102	.055	.157
Newlands.....	122241	29,400	100	.129											29,400	320	.090	.039	.129
North Platte.....	122229				33,430	.108									33,430	352	.078	.030	.108
Do.....	122230	84,730	100	.091	(?)										84,730	487	.061	.030	.091
Do.....	122221				8,650	.127	1,730	100	.305				3,550	\$0.310	13,930	(?)	.167	.029	.196
Rio Grande.....	122239	1,952	100	.157	105,629	.090	898	100	.114						108,479	385	.061	.030	.091
Do.....	122217	13,392	100	.171											13,392	183	.141	.030	.171
Total.....		178,994		.124	464,952	.116	9,642	100	.229				3,550	.310	655,103	307	.085	.036	.121
* Enlarging banks.																			
LIDGERWOOD STEAM DRAGLINE; BUCKET 1 CUBIC YARD; BOOM 50 FEET.																			
Shoshone.....	113210				79,721	\$0.130									79,721	401	\$0.107	\$0.023	\$0.130
PARSONS GASOLINE DRAGLINE; BUCKET ½ CUBIC YARD; BOOM 30 FEET.																			
Lower Yellow-stone.....	121137									4,937	\$0.110	6,550	\$0.099		11,487	302	\$0.070	\$0.034	\$0.104
P. & H. NO. 208, GASOLINE DRAGLINE; BUCKET ½, 1 CUBIC YARD; BOOM 50, 35 FEET.																			
Boise.....	121269				54,000	\$0.087									54,000	546	\$0.049	\$0.038	\$0.087
P. & H. NO. 206, GASOLINE DRAGLINE; BUCKET ¾, ½ CUBIC YARD; BOOM 45, 30 FEET.																			
Belle Fourche..	121152									16,427	\$0.153				16,427	211	\$0.109	\$0.044	\$0.153
Fort Peck.....	121151									17,581	.188				17,581	153	.129	.059	.188
Grand Valley...	121156	1,378	100	\$0.277	44,449	\$0.157	598	100	\$0.194						43,425	178	.105	.056	.161
King Hill.....	121178						6,300	(?)	.451						6,300	79	.319	.132	.451
Milk River.....	121154				3,340	.105				8,900	.136				12,240	272	.077	.051	.128
Do.....	121162									30,371	.110				30,371	281	.072	.038	.110
North Platte.....	121157				76,150	.119									76,150	306	.077	.042	.119
Rio Grande.....	121159	40,275	100	.106											40,275	330	.067	.039	.106
Do.....	121160	35,933	100	.141											35,933	225	.099	.042	.141
Shoshone.....	121161				19,154	.161									19,154	186	.101	.060	.161
Do.....	121153				21,175	.138									21,175	235	.087	.051	.138
Uncompahgre...	121155	6,988	100	.167			244	100	.254	11,014	.252	505	\$0.200		18,751	131	.144	.075	.219
Yuma.....	121158	10,700	100	.243	7,195	.149						4,820	.114		22,715	201	.134	.052	.186
Total.....		95,274	100	.141	171,463	.137	7,142		.422	84,293	.156	5,325	.122		363,497	218	.098	.050	.148
AUSTIN NO. 4 GASOLINE DRAG LINE, BUCKET ¾, ½ CUBIC YARD; BOOM 45, 30 FEET.																			
Boise.....	121164											37,150	.134		37,150	288	\$0.089	\$0.045	\$0.134
Carlsbad.....	121166											10,560	.261		10,560	106	.126	.135	.261
Huntley.....	121163	3,810	(?)	.199	5,480	.210				3,292	.253	375	.274		12,957	135	.150	.069	.219
Newlands.....	121165									7,900	.465	1,713	.240		9,613	89	.306	.120	.426
North Platte.....	121150						15,794	87	.234						15,794	161	.161	.073	.234
Total.....		3,810		.199	5,480	.210	15,794	87	.234	11,192	.403	49,798	.165		86,074	162	.140	.073	.213
Total all drag lines.....		2,215,793		.128	2,594,342	.099	74,424		.221	131,212	.166	101,210	.178		5,116,981	434	.076	.041	.117

MONTHLY PROGRESS REPORTS FOR SEPTEMBER, 1921.

Monthly conditions of principal Reclamation Service reservoirs for September, 1921.

[Elevation above sea level.]

State and project.	Reservoir.	Available capacity in acre-feet.	Elevation.		Storage in acre-feet.			Out-flow in acre-feet.	Elevation of water surface.		
			Spill-way crest. ¹	Lowest gate sill. ²	Beginning of month.	End of month.	Maximum.		Beginning of month.	End of month.	Maximum.
Arizona, Salt River.....	Roosevelt ³	41,305,000	2128	1903	722,544	678,691	747,822	.....	180.81	177.16	182.85
California, Orland.....	East Park.....	51,000	1199.68	1111.68	19,560	8,720	19,560	10,320	1177.15	1163.43	1177.15
Idaho:											
Boise.....	Arrowrock.....	280,000	3211	2956	86,000	23,950	86,000	106,254	3124.0	3064.00	3124.0
	Deer Flat.....	177,000	2518	2488	44,390	35,542	44,390	20,796	2500.25	2498.49	2500.25
Minidoka.....	Lake Wolcott.....	95,180	4245	4236	100,970	60,630	104,700	262,150	4245.48	4241.94	4245.79
	Jackson Lake.....	847,000	6769	6730	173,560	170,250	173,560	39,224	6739.54	6739.37	6739.54
Montana:											
Milk River.....	Nelson.....	27,000	2214	2200	25,300	23,600	25,300	239	2911.9	2211.3	2211.9
St. Mary Storage.....	Sherburne.....	66,000	4788	4720	30,400	28,000	30,400	2,400	4862.1	4860.4	4862.1
Sun River.....	Willow Creek.....	16,700	4130	4085	7,215	7,270	7,270	.....	4118.3	4118.4	4118.4
Nebraska-Wyoming, North Platte.	Pathfinder.....	1,070,000	5852	5670	729,186	577,380	729,186	176,398	5834.32	5824.01	5834.32
	Lake Alice.....	11,400	4182	4159	2,808	4,118	4,118	.....	4167.8	4170.6	4170.6
	Lake Minatare.....	60,766	4125	4074	23,484	29,009	29,009	.....	4104.2	4108.0	4108.0
Nevada, Newlands.....	Lake Tahoe.....	*120,000	6230	*6224	.....	.....	.....	27,180	6225.92	6225.35	6225.92
	Lahontan.....	290,000	4162	4060	172,440	155,560	172,440	27,976	4149.60	4146.80	4149.60
New Mexico:											
Carlsbad.....	McMillan.....	45,000	3267.7	3241.6	43,000	37,600	43,000	18,000	3267.4	3266.5	3267.4
Rio Grande.....	Elephant Butte.	2,638,860	4407	4231.5	2,080,518	1,993,613	2,080,518	128,039	4392.0	4389.5	4392.0
Oregon, Umatilla.....	Cold Springs.....	50,000	621.5	560	7,625	2,625	7,625	5,247	581.18	570.74	781.18
Oregon-California, Klamath.	Clear Lake.....	462,000	4540	4514	357,000	342,000	357,000	.....	4535.96	4535.32	4535.96
South Dakota, Belle Fourche	Belle Fourche.....	203,000	2975	2920	91,960	72,860	91,960	16,526	2958.3	2954.2	2958.3
Utah, Strawberry Valley...	Strawberry.....	250,000	*7558	7514	226,200	215,400	261,520	10,800	7554.7	7553.2	7559.6
Washington:											
Okanogan.....	Conconully.....	14,400	2290	2232	2,875	1,100	2,875	2,523	2258.5	2249.5	2258.5
Yakima.....	Bumping Lake.....	34,000	3426	3389	27,220	11,760	27,220	15,460	3429.8	3405.7	3429.8
	Lake Cle Elum.....	22,800	2134	2122	13,330	25,900	25,900	.....	2134.9	2134.8	2134.8
	Lake Kachess.....	210,000	2258	2192	168,375	106,580	168,375	61,795	2161.1	2229.4	2261.1
	Lake Keechelus.....	152,000	2515	2425	50,575	29,990	50,575	20,585	2501.8	2448.2	2501.8
Wyoming, Shoshone.....	Shoshone.....	456,600	5360	5132.3	431,688	417,703	431,688	35,059	5356.2	5354.0	5356.2

¹ Or maximum storage.² Or zero storage.³ Zero water depth at elevation 1902.2.⁴ Amount of silt shown by silt survey deducted from original capacity.⁵ Proposed regulation.⁶ Estimated low-water limit under proposed plan of regulation.⁷ Vested power draft.⁸ Elevation of reservoir raised 12 inches by stop logs in spillway.

SALT RIVER PROJECT, ARIZONA.

Operation and maintenance of irrigation system.—

Water was run in all of the canals during September. The demand for irrigation water service was very heavy during the last 10 days, owing to the close of the irrigation season.

There were five regular maintenance crews in the field during the month, and the following statement shows the average number of men and stock employed and the results accomplished: Daily average number of men, 185; daily average number of stock, 84; miles main canals cleaned, 39½; miles laterals cleaned, 246; linear feet stake and brush banks built, 4,294; old structures repaired, 232; cubic yards dirt fill placed, 10,006; and cubic yards concrete placed (repairs), 2.

The above includes work done in September in connection with the Cave Creek flood of August 24. The two regular maintenance crews completed their work on the Arizona Canal September 10, one crew going back on regular maintenance work and the other crew filling in the broken banks of the Grand Canal at Lateral 13. Water was again running in the Arizona Canal on September 2.

In addition to the above work, one regular construction crew, with an average of 57 men and 45½ head of stock, accomplished the following work: Linear feet corrugated iron pipe installed, 666; linear feet concrete pipe installed, 14; miles St. John's Canal

widened and deepened, 1½; miles waste ditches constructed, 3; cubic yards concrete placed, 61; miles new fence built, ½; and linear feet 16-inch well casing installed for road crossings, 65.

The Ruth dredger, with a daily average of 4 men and 4½ head of stock, berned 7 miles of the Western Canal.

Work continued on widening the Eastern Canal. The Monighan 2-yard machine moved 7,846 cubic yards of dirt and the Lidgerwood 1½-yard machine moved 6,837 cubic yards.

Operation of power system.—The total power generated during the month was 6,268,450 kilowatt hours. The Roosevelt Power Plant delivered power to the system practically continuously during the month. This plant generated 4,086,000 kilowatt hours. The Cross-Cut Plant operated continuously, generating 1,039,500 kilowatt hours. The Arizona Falls operated 96 per cent of the month, and generated 317,500 kilowatt hours. The South Consolidated Plant operated continuously, with a total output of 519,600 kilowatt hours. The Chandler Plant operated practically continuously, and generated 305,850 kilowatt hours.

The substations all operated during September without trouble, and all pumping plants were available for use as required.

Construction work.—Work on construction of new drainage pumps was started.—C. C. Cragin.

YUMA PROJECT, ARIZONA-CALIFORNIA.

The second heaviest rainfall recorded by the Weather Bureau in 43 years occurred on September 29 and 30, when 3.65 inches of rain fell in 24 hours. Several breaks in the Main Canal occurred at and below the Picacho wash. The damage to the canal was estimated at \$25,000. Great damage was done to hay and to the second crop of alfalfa seed, and cotton was injured to some extent. With the rise in price of cotton, the financial outlook was considerably improved. A considerable amount of last season's cotton crop which was held over was disposed of.

Construction.—On the South Drain, the 30-B Bucyrus advanced 1 mile, excavating 21,500 cubic yards of earth. A flume was built across this drain on the Ingraham Lateral at the midline of Section 25, and bridges on the mid-line and east line of the same section partially completed. On the East Drain, the type 14 Bucyrus resumed work on the 15th and advanced 0.36 mile, excavating 11,600 cubic yards of earth.

Operation and maintenance.—The P. & H. dragline worked on cleaning the Main Drain between Fourteenth Street and Somerton Avenue; 1½ miles of drain were cleaned, with an excavation of about 5,000 cubic yards of material. On the Reservation Division Ruth Dredger No. 6 cleaned 3½ miles of canal, excavating 4,550 cubic yards of silt; on the Valley Division Ruth Dredgers 7, 8, and 9 cleaned 7.6 miles of laterals, excavating 10,400 cubic yards of silt. Thirteen thousand acre-feet of water were delivered to users.

The maximum discharge of the Colorado River was 37,500 second-feet; minimum, 8,000 second-feet; total discharge for the month, 1,100,000 acre-feet. On the morning of September 30, the gage height was 16.8, with a discharge of 10,600 second-feet; during the day the river rose 3.4 feet, owing to the heavy rain.—*Porter J. Preston.*

YUMA MESA DIVISION, ARIZONA.

Working conditions were not so favorable during September, owing to high temperature. A severe rain storm during the night of the 29th caused considerable water to flow down the supply canal, undermining the uncompleted structure for the spillway.

The crushing plant at the Mesa Quarry was operated almost continuously by a small force of men, the rock being used in surfacing roads and for concrete at the B Lift Pumping Plant. The storage yard for the pipe manufacturing plant was graded.

At the B Lift Pumping Plant concrete was poured for 100 feet of the 72-inch force main and the floor of the spillway. The roof trusses were received and placed. The wiring and switchboard were also being assembled.

A large quantity of reinforcing fabric, cement, and lumber was received and hauled to different designations.

Office engineering was confined to designing forms for present structures and making preparations for the construction of structures and pipe lines of the lateral system.

Labor exceeded the demand during the month.—*Porter J. Preston.*

ORLAND PROJECT, CALIFORNIA.

Moderate temperatures prevailed during September, but there were several days during the later portion of the month on which disagreeable north winds occurred. The fifth and last crop of alfalfa was nearly

all matured, but only a portion of the crop was cut. Some of the early planting of milo was gathered and the harvesting of the almond crop completed. An excellent yield of prunes was obtained on the young orchards. The crop was picked, dipped, and practically all dried during the month.

There was a slight increase in the natural flow of Stony Creek and the diversions of the various irrigators along the creek were less than for the preceding month. Draft from East Park storage amounted to 10,300 acre-feet, and water deliveries consisted of 6,100 acre-feet to 13,600 acres irrigated.

Three men were engaged in mowing weeds on laterals of the distribution system, and the cleaning and repair of the East Park Feed Canal was completed early in the month. One hundred cubic yards of gravel were delivered by one team for fall work on concrete lining.

The fifth annual Glenn County Fair was held at Orland September 19 to 24. The fair was a success from every viewpoint and was in many ways the best exhibition ever put on by the fair management. Although the receipts for this year did not equal those of the banner year of 1920, they were sufficient to meet all expenses and to provide a small surplus. The exhibits of the various farm centers of the county were the subject of much favorable comment. Of particular interest to the Orland project was the award of first, second, and third prizes for the farm center exhibits, to the Westside, Plaza, and Lake centers, respectively, all three of which are located in the project.—*R. C. E. Weber.*

GRAND VALLEY PROJECT, COLORADO.

September weather was clear and dry, with an unusually high percentage of sunshine and practically no precipitation. Conditions were favorable for outside work of all kinds as well as for the maturing and harvesting of crops.

Crops were generally in good condition and the yield for the season will be better than average but prices are unsatisfactory from the standpoint of the farmers. The third cutting of alfalfa was harvested, producing a good yield of excellent quality. Considerable damage was caused by the heavy rains in August to the first two cuttings of hay which were stacked, and the loss from this cause amounted to 10 to 20 per cent. The digging of sugar beets started at the end of the month and from present indications the yield of this crop will be above the average. The peach harvest in the Palisade district was completed early in the month and the picking of apples over the valley was in full swing. The fruit crop, both in yield and quality, was better than for several years, and if fair prices are received the general conditions in the community will be materially improved. A light frost was experienced on the 21st and another on the 30th, which caused slight damage to tomatoes and melons.

The damage by the floods of August 23 to the project main canal was repaired far enough to permit full water service to be restored on September 7. It was necessary to construct a detour canal about 800 feet long around the section near Station 1213 where the break occurred. The repair work on the irrigation system was continued and practically completed. Water service was continuous from the 8th until the end of the month and approximately 7,000 acre-feet of water were delivered to the lands in the project and the two irrigation districts.

In the Grand Valley Drainage District one drag line excavator was operated until the 15th on the com-

pletion of drain E-4. Nine hundred and twenty linear feet of drain were completed, involving 4,800 yards of excavation. One highway bridge and a number of minor structures were installed. This drain is the last work to be done under the cooperative contract with the Grand Valley Drainage District, this contract being now 100 per cent complete. Drainage investigations were continued on project lands and preparations made to begin the construction of two short drains.

Among the visitors to the project during the month was C. C. Inglis, connected with the Public Works Department of India.—*S. O. Harper.*

Prevailing crop prices at close of September, 1921.

Project.	Alfalfa hay, per ton.		Barley, per bushel.	Oats, per bushel.	Wheat, per bushel.	Potatoes, per bushel.
	In stack.	Baled at ship- ping point.				
Salt River.....	\$6-8	\$10-12	\$0.65	\$0.52	\$1.29	.....
Yuma.....	8.00	10.50	.....	.....	.....	.....
Orland.....	7.50	10.50	.50	.....	1.10	.....
Grand Valley.....	8.00	12.00	.....	.50	.75	\$0.90
Uncompahgre.....	5-10	.....	.55	.37	.87	.75
Boise.....	4.00	8.00	.35	.45	.75	1.20
King Hill.....	5.00	.....	.....	.42	1.25	1.10
Minidoka.....	4.00	8.00	.....	.....	.81	.90
Huntley.....	7.00	.....	.....	.....	.....	.....
Milk River.....	7.00	.....	.47	.13	1.19	1.20
Sun River.....	6.00	10.00	.60	.50	1.10	1.00
Lower Yellowstone.....	6.00	.....	.35	.25	1.11	1.00
North Platte.....	.....	7.00	.....	.25	.90	.90
Newlands.....	6.00	9.00	.....	.....	.....	1.20
Carlsbad.....	.....	10.00	.75	1.20	.....	.....
Rio Grande.....	.....	14-16	.....	.55	1.20	.....
North Dakota pumping.....	10.00	.....	.27	.30	1.15	1.00
Umatilla.....	10.50	.....	.....	.....	.....	.....
Klamath.....	6.00	14.00	.53	.35	.96	.....
Belle Fourche.....	6.00	10.00	.40	.33	1.15	1.00
Strawberry Valley.....	6.00	9.00	.50	.40	.80	.75
Okanogan.....	10.00	.....	.....	.....	.....	1.20
Yakima.....	.....	.....	.....	.....	.....	.....
Sunnyside.....	.....	9-11	.....	.....	.....	1.05
Pieton.....	.....	9-11	.....	.....	.....	1.05
Riverton.....	6.00	.....	.40	.40	.90	.90
Shoshone.....	5.00	7.50	.....	.....	.96	.60
Indian projects:	.....	.....	.....	.....	.....	.....
Blackfoot.....	12.50	.....	.48	.32	1.01	.....
Flathead.....	10.00	15.00	.....	.47	1.00	.90
Fort Peck.....	.....	.....	.....	.17	1.25	1.00

UNCOMPAHGRE PROJECT, COLORADO.

September weather conditions were normal. Precipitation occurred at the Montrose Station on only two days, the total rainfall amounting to only 0.09 of an inch.

The crop situation was about normal at the end of the month. All the grain crops were harvested, and thrashing was in progress. The digging of potatoes was proceeding rapidly, but the growers were threatened with a car shortage, and on account of the large acreage that was planted to potatoes there was not enough storage to take care of the crop. The onion crop was moving to the market at a rate approximating about \$3 per hundredweight. The third cutting of alfalfa was being stacked. A large acreage was also being planted to winter wheat.

The demand for irrigation water was not very heavy, and the supply available from the Gunnison Tunnel and the natural flow of the Uncompahgre River were more than sufficient for project needs. The

flow through the Gunnison Tunnel was variable and depended upon the demand for irrigating water.

The P. & H. dragline was idle during the entire month.

On account of the lack of demand for irrigating water, the ditch riders were employed for the greater portion of the month in cutting weeds and brushing along the canal and lateral sections.

The maintenance work required on the drainage trenches at the Montrose and Delta Canal slides near Happy Canyon was completed. The bowlder concrete wall at the Happy Canyon flume crossing on the West Canal was also completed. The wasteway from the West Canal at the Happy Canyon Creek was ripped for a length of 150 feet. A massive concrete drop was placed in the wasteway from the Montrose and Delta Canal to Happy Canyon Creek, in order to prevent excessive cutting.—*L. J. Foster.*

BOISE PROJECT, IDAHO.

The temperature for September was below normal. The first frost of the season occurred on the 10th, which was 30 days earlier than last year. The first rain of consequence since May occurred on the 19th.

Labor conditions.—Harvest fields, fruit picking, and packing furnished temporary employment for the surplus labor that has been available during the past few months.

Farming operations.—Thrashing of grain was about completed and clover-seed hulling was begun. The third cutting of alfalfa was partly in the stack. Early potatoes were all shipped. The greater part of the prune crop was picked and shipped and apple picking was well started.

Water supply.—The flow of Boise River increased slightly during the month. The draft on the storage reservoirs was light.

Operation and maintenance.—The demand for water gradually declined during the month until the canal system was carrying about 25 per cent of its capacity. Operating crews were decreased.

Drainage.—One drag-line excavator was in operation on the Hellyer drain. Drainage studies were continued on the water-logged areas below Deer Flat Reservoir.

Surveys.—Field work was in progress on the Black Canyon Division. Estimates and plans were being prepared for the Owyhee secondary project.

Visitors.—Among the visitors during the month were the Secretary of the Interior and the Director.—*J. B. Bond.*

KING HILL PROJECT, IDAHO.

September weather was favorable for construction work.

Construction.—With the exception of pouring joints, the Cold Springs flume was completed, and camp moved to the site of Slick concrete flume, where 3,920 linear feet of flume were constructed. An average force of 23 horses and 125 men was engaged on this work.

At King Hill gravel was being washed for use in manufacturing lock joint pipe, but forms and equipment for the pipe had not arrived.

Engineering.—One field party was employed throughout the month on construction work.

Operation and maintenance.—Water deliveries were uninterrupted until the 29th, when a break in a wooden siphon necessitated turning water out of the canal below lateral 4. Deliveries for the month varied

from a maximum of 205 second-feet to minimum of 141 second-feet. A small maintenance crew was engaged in cleaning laterals and around main canal siphons.

Labor continued restless and was less plentiful than during the first of the season.—*Walter Ward.*

MINIDOKA PROJECT, IDAHO.

September weather was generally seasonable, but dry, the total precipitation being only 0.07 of an inch. In spite of the lack of rainfall, however, the demand for water for irrigation was light, owing chiefly to the cool nights, on seven of which the temperature fell below freezing. The total amount of water delivered to farm units was 9,463 acre-feet, as compared with 14,099 acre-feet in 1920.

The flow of the main north side canal fell from 1,308 second-feet on the 1st to 965 second-feet on the 30th, and that of the main south side canal from 827 to 409 second-feet. The average flow of the north side canal was 1,183 second-feet and of the south side 543 second-feet.

Operation and maintenance activities were rather light on account of the lessened demand for water, although some trouble was caused by weeds blowing into the canals. All pumping stations were operated as needed. The total amount of water pumped at the First Lift was 22,800 acre-feet.

At the power house, the total amount of power generated was 3,600,730 kilowatt hours. The maximum load was 7,765 kilowatts and the average, 5,004, with a load factor of 65.3 per cent. There were practically no interruptions to service during the past month.

The delivery of stored water from Jackson Lake ceased on the 9th, when the gates were closed so as to permit only the normal flow to be discharged. On the 13th the gates were closed entirely, and all water entering the lake thereafter was stored for next season's use. There were 151,340 acre-feet left in the reservoir out of the total storage of 847,000 acre-feet, indicating that nearly 700,000 acre-feet were used during the past season. This was the largest amount of water Jackson Lake has ever furnished in any one year. Last year the amount of water left in the reservoir was 126,120 acre-feet, or about 25,000 acre-feet less than in 1921.

At American Falls one party was engaged almost the entire month in staking out street intersections in the new townsite. Another party worked for a week on a topographic survey of Snake River channel above and below the diversion dam of the Idaho Power Company.

Elevations of ground water were taken at 202 wells around the reservoir, and readings were taken at the stations on streams flowing into the reservoir basin.

The appraisal of lands in the Fort Hall Indian Reservation was carried on. There were 8,629 acres under the 4,385 contour appraised, making a total of 62,022 acres.

One party was engaged for a week on a topographic survey on the North Side Pumping Division. The area covered was 840 acres, making the total to date 152,430 acres.

Two parties worked the entire month and two other parties worked for three weeks taking topography on the Mountain Home project. The area surveyed was 8,910 acres, making a total to date of 13,040 acres. The estimated per cent completed was 68.

Shipments of farm products amounted to 174 cars.

The flow at Howell's Ferry averaged about 3,675 second-feet until the 25th, when it was increased to over 6,000 second-feet in order to draw down Lake Walcott below spillway crest, so as to permit some repair work below the spillway.

The Cassia County fair was held in Burley from September 20 to 22, inclusive. In points of attendance, variety, and character of displays, it was considered one of the most successful fairs ever held.

Secretary of the Interior Fall and party visited the Minidoka project on the 5th and inspected the American Falls dam and reservoir site on the following day. With the Secretary were Director Davis, Chief Engineer Weymouth, Congressman Addison T. Smith, Gov. Davis, Commissioner of Reclamation Swendsen, and others.—*Barry Dibble.*

HUNTLEY PROJECT, MONTANA.

September weather was good, with little precipitation. Irrigation was light, with practically none after the 15th.

The Ruth dredger was in continuous operation, working one shift of eight hours, and cleaned 74 miles of laterals.

Several small checks and drops on lateral Q were replaced with structures of permanent type.

The Austin dragline continued work on drain 18, excavating 1,600 linear feet of drain.

Farming operations were continued on the alkaline area near Newton and 80 acres were seeded to rye and winter wheat. During the latter part of the month this grain was being irrigated and an excellent stand of sweet clover was obtained on about 35 acres of land seeded last year.

Secretary Fall and Director A. P. Davis visited the project on the 19th, and held a conference with the directors of the Irrigation District.

The beet harvest was well under way and such excellent progress was being made that by October 15, if the weather remains favorable, this harvest will be completed. Beets were making excellent yields and will be the most profitable crop grown this year.—*A. R. McGinness.*

MILK RIVER PROJECT, MONTANA.

September weather was only moderately favorable for construction, operation and maintenance work, and farming operations, and decidedly unfavorable for survey operations. The first killing frost occurred on the 30th. Thrashing and the third cutting of alfalfa were nearing completion. The range was in poor condition, although it was improved by the rains, but in general stock were in good shape. The labor supply was deficient throughout the month.

The International Joint Commission held a hearing at Chinook on the 15th and at Lethbridge, Alberta, on the 17th, relative to the division of the Milk and St. Mary Rivers waters between the two countries under the treaty of 1910. The Milk River Cooperative Association was formed at Malta on the 6th, with the object of expediting settlement on the Milk River and other projects in northern Montana.

Surveys.—Farm unit and lateral extension surveys were continued in the vicinity of Glasgow and Hinsdale. Plane-table parties were engaged on topography of Beaver Creek Flats in the vicinity of Hinsdale and Ashfield. Considerable work was done in putting in test wells on Beaver Creek Flats, as well as at other points on the project, for drainage observations. Work, especially topographic work, was much delayed by stormy weather and high winds.

Construction by contract.—The contractor for Nelson Reservoir enlargement made good progress. Four small earthwork contracts were under way, of which two were completed, but poor progress made on the other two. Bids will be opened October 1 for about 70,000 yards of earthwork on lateral extensions in the vicinity of Hinsdale.

Construction by Government forces.—The road crew completed about 7 miles of operation and maintenance road on the Vandalia and Nelson Reservoir canal systems, which completes that program for the season. Drainage construction by P. & H. drag line was continued on the ND-2 located about 3 miles east of Nelson Reservoir. Work was begun on measuring device at the head of Dodson North Canal and a considerable number of small structures, such as bridges, turnouts, measuring devices, etc., were installed.

Operation and maintenance.—Only a small amount of water was delivered for irrigation purposes, the canals being operated but a small portion of the time. Maintenance work included the cleaning of Dodson North Canal by drag line to mile 8, which completes the program on that canal for the season. The drag line was then moved to the head of DS-50 lateral for the balance of the month. The Ruth ditch cleaner was operated on cleaning Dodson North Canal Laterals and then moved to the Dodson South Canal Laterals. Both machines operated one shift per day throughout the month. Repairing concrete on Vandalia Dam and the painting of the service bridge there were in progress. Repairing of flumes, culverts, and other structures, as well as grubbing willows and miscellaneous jobs were also in progress.—*George E. Stratton.*

ST. MARY STORAGE DIVISION.

September weather was unfavorable for field work of any kind. There were several snow and rain storms and several very windy days.

The St. Mary Canal was not operated, and most of the water stored in Sherburne Lakes Reservoir was held during the month. The total storage at the beginning of the month was 30,400 acre-feet, and at the end of the month 28,000 acre-feet. A small crew, consisting of a foreman with seven men and four teams, was employed the entire month rebuilding canal bank to prevent excessive leakage, and the Bucyrus drag line was employed up to the 27th flattening canal banks and removing slide material from the canal section. Maintenance work consisted of strengthening one section of the canal bank where a slip occurred on the outside of the bank, and removing slide material from the canal section.—*R. M. Snell.*

SUN RIVER PROJECT, MONTANA.

September weather was cool and precipitation about normal. A light snowstorm occurred from the 9th to the 11th.

Government forces continued the construction of structures for Lateral D Extension, Fort Shaw Division, and the improvement of the operation highway along the Pishkun and Sun River Slope canals. Contract work on the Big Coulee Division was completed.

The Fort Shaw Canal system was operated throughout the month under a small head, but few deliveries for irrigation purposes were made. The Greenfields system was operated from the 1st to the 7th and from the 15th to the 30th, inclusive. Ten days of this operation was for the purpose of priming and puddling the Big Coulee Division ditches.

Maintenance work consisted of cleaning weir pools on Districts 2 and 5 of the Fort Shaw Division, cleaning and repairing cross drainage culverts, and deepening cross drainage ditches on the Pishkun and Sun River Slope canals, and puddling about 300 feet of the bottom of Pishkun Canal at Arnold Coulee. Owing to high winds it was necessary to repair all telephone lines.

Farmers were busily engaged in stacking and thrashing grain, irrigating, putting up hay, harvesting potatoes, plowing, and hauling fuel for winter use. The maximum yield of wheat on the Greenfields Division was 48 bushels per acre, but the average yield was considerably lower than the farmers anticipated earlier in the season. Potatoes were showing a fair yield with excellent quality. Except for wheat and potatoes, there was practically no demand for farm produce. Eight cars of wheat, two of potatoes, and one of hay were shipped from the project during the month.—*Geo. O. Sanford.*

Project weather during September, 1921.

Project.	Station.	Temperature, °F.			Precipitation (inches).
		Maximum.	Minimum.	Mean.	
Salt River.....	Phoenix, Ariz.....	105	60	82.6	0.33
Yuma.....	Yuma, Ariz.....	109	62	83.8	3.65
Orland.....	Orland, Calif.....	102	46	72.0	0.01
Grand Valley.....	Grand Junction, Colo.....	91	40	67.6	0.04
Uncompahgre.....	Montrose, Colo.....	88	31	63.55	.09
Boise.....	Boise, Idaho.....	83	35	57.5	0.61
King Hill.....	Glens Ferry, Idaho.....				
Minidoka.....	Burley, Idaho.....	88	24	55.2	0.07
Huntley.....	Ballantine, Mont.....	98	30	55.8	0.67
Milk River.....	Malta, Mont.....	80	27	53.3	1.59
St. Mary storage.....	Near Babb, Mont.....	73	23	47.0	2.06
Sun River.....	Fort Shaw, Mont.....	84	24	51.9	0.57
Lower Yellowstone.....	Savage, Mont.....	94	33	56.0	0.72
North Platte.....	Wynote, Wyo.....	93	21	60.5	0.02
Newlands.....	Fallon, Nev.....	90	30	60.3	0.28
Carlsbad.....	Carlsbad, N. Mex.....	100	45	77.4	0.46
Rio Grande.....	El Paso, Tex.....	96	58	76.5	2.49
North Dakota pump-ing.....	Williston, N. Dak.....	84	35	55.0	2.43
Umatilla.....	Hermiston, Oreg.....	84	26	58.3	0.42
Klamath.....	Klamath Falls, Oreg.....	85	29	55.7	0.06
Belle Fourche.....	Orman, S. Dak.....	98	28	58.2	0.45
Strawberry Valley.....	Provo, Utah.....	86	28	59.1	0.68
Okanogan.....	Omak, Wash.....	87	29	57.0	T.
Yakima:					
Sunnyside.....	Sunnyside, Wash.....	83	29	58.0	0.35
Tieton.....	Cowiche, Wash.....	74	33	55.8	0.15
Riverton.....	Diversion Dam, Wyo.....	86	25	55.6	0.12
Shoshone.....	Powell, Wyo.....	89	27	55.2	T.
Indian projects:					
Blackfeet.....	Browning, Mont.....	70	22	42.0	0.84
Flathead.....	St. Ignatius, Mont.....	80	23	50.8	1.03
Fort Peck.....	Poplar, Mont.....	93	32	56.6	1.62

LOWER YELLOWSTONE PROJECT, MONTANA.

September weather was ideal for maintenance and construction work, and the harvesting of crops. The minimum temperature of 33 degrees on the 11th was the coldest, and it is not a common occurrence for the month of September to be so free from frost.

The irrigation season closed on the last day of the month, and the total area irrigated during the season amounted to approximately 18,500 acres. During the latter part of the month water was being wasted at various sluice gates on the main canal for sluicing out silt.

The harvesting of grain crops was practically completed, and a third cutting of alfalfa was being har-

vested on many farms. The harvesting of sugar beets and potatoes was in full swing during the last two weeks of the month, and the yield per acre was better than anticipated. Several fields of beets were yielding 15 tons to the acre, and 250 bushels of potatoes to the acre was not uncommon. Corn on the project was becoming a popular crop, and at the State fair in Helena, Richland County won 59 prizes, 25 of which were for corn exhibits.

The operation and maintenance organization was considerably reduced during the month. Two less ditchriders were employed, and only such maintenance work as is absolutely necessary for proper water distribution of the coming season was carried on. The following work was accomplished under operation and maintenance: 900 linear feet of the lower end of drain 2-W were cleaned; 75 yards of sand and gravel, to be used in the construction of the concrete check to replace the wooden one at canal mile 30.2, were hauled; a 20-foot pipe culvert was placed in lateral LL-4 at the intersection of the main highway; the telephone line from the main road to Bell Hill through the center of section 25, T. 22 N., R. 59 E. was removed, and placed on the south side of the same section, where there is a county road; the Ruth ditch cleaning machine worked the entire month on the PP system, and cleaned 6.1 miles of ditches.

The construction force installed seven pipe culverts for surface drains, in connection with laterals under contract No. 864. Seven decayed wooden drops were replaced with reinforced concrete structures. The routine maintenance work of repairing ditch banks, cutting brush, etc., was carried on. Satisfactory progress was made by the 16 subcontractors under J. E. Hilton, in carrying on the construction under contract No. 864. During the month 98,700 cubic yards of material were moved.

In addition to the campaign being carried out by the influential men of the valley in securing dairy stock, an organization was formed to secure options on all tracts of land in the valley that can be considered as excess holdings. In spite of the money situation, one modern barn and two modern residences were under course of construction during the month.—*L. H. Mitchell.*

NORTH PLATTE PROJECT, NEBRASKA-WYOMING.

September weather conditions were highly favorable for construction, operation and maintenance, and farming, with little precipitation. High winds on the 24th and 30th retarded construction activities on these dates, and observations show light frosts occurring on the 21st and 30th.

Operation and maintenance.—From two to three valves in the South Tunnel of Pathfinder Dam were kept open during the month to supply the demands of irrigation. The average outflow for the month was 2,970 second-feet, and the total amounted to 176,398 acre-feet.

The diversion into the Interstate Canal was decreased from 1,700 second-feet on the 1st to 815 second-feet on the 30th, which marked the close of the irrigation season. The flow in the canal was at all times ample to meet the demands of irrigation, deliveries being made on the supply on demand basis the entire month. At the close of the period there were only 187 users drawing water on the entire division. About 800 second-feet will be run through the canal the next three or four weeks for the purpose of filling the reservoirs at the lower end of the system.

Gopher holes in the Spottedtail section of the Interstate Canal necessitated the wasting of about 50 second-feet of water through Spottedtail Wasteway on the evening of the 22d. This waste caused considerable trouble farther down Spottedtail at the Great Western Sugar Co.'s intake, and also filled the Enterprise Canal. Action was taken to relieve the situation through the enlargement of Spottedtail Outlet.

Deliveries did not require the diversion into the Fort Laramie Canal to exceed 229 second-feet. The diversion at the end of the month was 145 second-feet.

Good service was rendered by the Tri-State company in the delivery of water to the head of the Willis Lateral on the Northport Division, the supply at times exceeding the demand and necessitating 48 second-feet being wasted down Indian Creek for several days. A small head of water was turned into Northport Canal on the 21st for priming purposes.

Dragline No. 122230 continued work on the Interstate Canal, reinforcing banks until the 21st, when it moved to Spring Canyon Flume, where it will commence widening the canal. During the month 7,090 cubic yards of material were placed, at an average of 262 cubic yards per shift.

Crops.—The crop yield this season was fair. About 90 per cent of the thrashing was complete, and the third cutting of alfalfa was about 50 per cent complete, as was the potato harvest. The beet harvest, which started on the 19th, was approximately 15 per cent complete, the yield, however, being only fair. The potato market was strong and steady, and prices remain firm, averaging between \$1.40 and \$1.60 per hundredweight, f. o. b. cars. Stock feeders were still in doubt as to the advisability of feeding stock this winter, and only a small number of feeders have been shipped in.

Drainage.—Dragline No. 122229 continued operations on the Minature Drain the entire month; operating two 8-hour shifts daily; 18,100 cubic yards of material were moved, at an average of 326 cubic yards per shift.

Dragline No. 121157 was engaged in the excavation of a wasteway to drain laterals 10, 15, and the outlet to Dutch Flats and Stewart Draw. Upon completion of the above it was moved to the Spottedtail Diversion structure, where it worked until the 22d, when it was shipped to Mitchell to engage in the excavation of a temporary outlet to the Spottedtail drainage area, hoping to relieve the congested condition existing at the juncture of the Mitchell drainage ditch and Enterprise Canal.

On the Fort Laramie Division electric drag line No. 131313 completed the excavation of Cherry Creek Drainage System on the 6th, and spent the remainder of the month in moving to Katzer Drain; 4,589 cubic yards of material were moved during the month, averaging 340 cubic yards per shift. A total of 821,970 cubic yards of material were moved on the 25.6 miles of drain, with an average of 678 cubic yards per shift.

Construction.—Storage Division: Work continued on the excavation of the valve house cave and the concreting of the North Tunnel. Two shifts were worked daily; 45 cubic yards of class 3 material were excavated; and 83 cubic yards of concrete were placed. The crew engaged in the construction of a telephone line to Casper, Wyo., have dug 416 holes to date.

Fort Laramie Division: The three electric drag lines working on the Fort Laramie Canal in Wyoming oper-

ated two 8-hour shifts daily. The total yardage moved for the month was 74,205 cubic yards, which completed 1.26 miles of canal. It is expected that November 1 will witness the completion of the canal in Wyoming.

Dragline No. 121150 continued work on placing earth lining on the Fort Laramie Canal, operating two 8-hour shifts daily; 13,875 linear feet of canal were lined, which makes a total of 42,765 feet, or 8.1 miles, to date.

The powder crew, averaging seven men and one Ford truck, drilled 3,111 linear feet of holes and used 6,675 pounds of TNT in blasting classified material on the Fort Laramie Canal.

Work continued on the construction of the new head-works on the Fort Laramie Canal, with one 10-hour daily shift. The excavation was completed and approximately 142 cubic yards of concrete were placed in the structure proper. This auxiliary structure will greatly relieve the serious sand conditions now encountered in operating the canal under a low head.

Good progress was made on the construction of canal and lateral structures by Government forces. Work progressed in a fair manner on the Upper Cherry Creek Valley structures. An excellent showing was made on the structures in the Second Lateral District, 1,065 cubic yards of concrete being placed. Contracts for the construction of the two East Springer Lateral Siphons were let to local contractors and the work is progressing in a satisfactory manner. The prices bid on recent earthwork and gravel hauling contracts remained at the same low level established in previous months.

Northport Division: The excavation of the Northport Canal was continued by the electric drag line and the Bucyrus Class 14 machine. The elevating grader outfit completed earth fills ahead of the machines on the 22d. Good progress was made on the construction of structures by Government forces, and the earthwork and gravel hauling contractors were progressing in a satisfactory manner. The contract for the construction of canal siphons across Bratten and East Bratten Creeks, East Upper and West Upper Dugout Creeks was let to a local concern and the contractors were on the job.

Power system.—The Lingle Power Plant was operated three 8-hour shifts daily until the 14th, at which time Unit No. 1 was shut down for repairs to the turbine. Unit No. 1 was put into operation on the 20th and Unit No. 2 was shut down while repairs were made to the turbine. Operations were resumed by Unit No. 2 on the 24th. Four thousand five hundred and eighty kilowatt hours were sold to the town of Lingle, Wyo.; 36,800 to Torrington, Wyo.; 8,800 to Morrill, Nebr., and 33,000 to Mitchell, Nebr.

Surveys.—The field parties were kept busy furnishing lines and grades for construction forces and making miscellaneous investigations in connection with drainage, pumping units, and seeped areas.

Settlement progress.—Three thousand five hundred and three applications were received on 224 vacant farm units at the land opening held at Torrington, Wyo., September 9, 1921. Entries were being made rapidly and at the end of the month only a few filings had not been made at the land office. The Union Pacific Railroad ran a special train from Gering to Lyman on Labor Day. This was the first train over the U. P. R. R. extension being constructed into Cherry Creek Valley.—*E. E. MacDonald.*

NEWLANDS PROJECT, NEVADA.

The first frost of the 1921 season occurred on September 13, eleven days earlier than the first frost for

the 1920 season. A temperature of 30° F. was recorded and, as a result, the melon crop was damaged. No precipitation occurred during the month. Conditions were favorable for outside work. Labor was plentiful. The third cutting of alfalfa was being harvested at the end of the month. As harvesting was in progress, only a small amount of water was used for irrigation. The flow in the Truckee Canal was sufficient for irrigation and for operation of the Lahontan Power Plant. The operation of this plant from Lahontan Reservoir was discontinued on the 24th.

Truckee Canal improvement work was continued for the reinforcing of the lower bank, using one Monighan drag line excavator, an Austin drag line, and teams.

Drainage construction progressed satisfactorily with a Class 14 Bucyrus drag line excavator in operation on the L Drain, a similar machine on the New River drain, and a Class 208 P. & H. excavator on the Lower Soda Lake drain. A Monighan drag-line excavator was moving for commencement of work on the Kent Lake drain near Stillwater. Several drain structures were installed.

Maintenance work consisted largely of replacing concrete lining in Gilpin spillway tunnel in the Truckee Canal. In addition, eight minor structures were repaired in the various districts and some riprap was placed in the L and S canals.

The Churchill County Fair was in progress from September 14 to 16. The live-stock, poultry, and produce exhibits were unusually fine.—*John F. Richardson.*

CARLSBAD PROJECT, NEW MEXICO.

September weather was normal and satisfactory for all growing crops. The total run-off of the Pecos River at the Dayton station amounted to 14,200 acre-feet. The maximum flow was 700 second-feet on September 1, and the river was discharging 100 second-feet at the end of the month.

A small maintenance crew was employed cleaning laterals for such work as was absolutely necessary, and making minor repairs. Drain C in the Otis district was cleaned of moss for the second time during the season.

General crop conditions were very good. Cotton picking started about the 15th, and the yield of this crop was expected to be above the average on account of the prospect of the top crop maturing. Illustrative of the higher percentage of the maturity of the crop, as compared with last year 65 bales of cotton were ginned to October 1, 1920, as compared with 553 bales ginned to October 1, 1921. The price of staple cotton grown in this district started at about 23 cents per pound, and at the end of the month the same grade of cotton was selling for 28 to 30 cents with the price trend apparently upward. Cotton picking started at 75 cents per hundred, but at the end of the month the rate on some farms was \$1.25 per hundred. At the close of the month practically all surplus labor was employed in the cotton fields. The thrashing of alfalfa seed was in progress during the month, with comparatively low yields reported. Alfalfa hay was selling at the close of the month at an average price of about \$10.50 per ton.

The financial conditions on the project so far as the farms were concerned materially improved, owing to the opening of the cotton market. Range conditions were good, but the price of cattle and sheep continued to be poor. It was reported that feeders both of cattle and sheep will be reaching the project about the middle of October. Material progress was made in the installation of a cottonseed oil mill, which will probably be located at Loving.—*L. E. Foster.*

RIO GRANDE PROJECT, NEW MEXICO-TEXAS.

September weather was warm. The precipitation for the month was 1.04 inches above normal; the normal for the month (an average of 40 years record) is 1.45 inches. Considerable rain fell on the project, damaging the fourth cutting of hay.

The inflow at San Marcial for the month was 77,483 acre-feet.

The amount of storage in the reservoir at the end of the month was 1,993,613 acre-feet.

On the evening of September 17 a heavy rain caused a flow of water down the Hart Arroyo, which emptied into the Franklin Canal, overflowing the banks of the canal and flooding several streets in the section near the river. The waste gates from the canal were opened immediately so that the overflow lasted only about 15 or 20 minutes.

The amount of sand carried into the canal from the Rio Grande seemed to be greater than in previous years, probably owing to the frequent rains causing sand bars to form in the river at the outlet of the arroyos. The amount remaining was not excessive, due to the skimming weirs installed and the frequent sluicing during the operation season.

The first bale of cotton was ginned on the 7th, and 55 bales were ginned to date. The crop harvested averaged three-quarters of a bale to the acre. Sweet potatoes were being harvested and promised a fair yield. The Elephant Butte Alfalfa Association, a marketing organization for the farmers, shipped 55 cars of alfalfa from the El Paso Valley during the month.

The construction at Elephant Butte was 98.6 per cent completed at the end of the month. The excavation was completed on the 27th, and the concreting of the spillway channel was continued throughout the month. The concrete yardage in the spillway channel was considerably increased over the original estimate, owing to the many pockets encountered following the sluicing operations which were necessary to fill with concrete to insure the safety of the structure. Nine Government machines and one contract machine operated on drainage and lateral construction. In the Mesilla Valley machine excavation totaled 100,570 cubic yards for five machines, one machine working on one shift and one on two shifts on drains, two machines on one shift and one on one shift on laterals. Eight-tenths of a mile of drain and 2.6 miles of laterals and levees were constructed, and 2 miles of laterals were cleaned. In the El Paso Valley three Government machines operated on a one shift basis, one on a two-shift basis, and one contract machine was in operation. In addition there were a number of team crews. A total of 94,437 cubic yards was excavated in 1.3 miles of drains and 1.4 miles of canal and lateral.

The Farm Bureau of El Paso County held its celebration and picnic on Tuesday, September 27.—*L. M. Lawson.*

NORTH DAKOTA PUMPING PROJECT.

September weather was generally cool and cloudy but with no killing frosts until the 30th, which is exceptionally late for this vicinity.

Thrashing was delayed considerably by the rains of the first part of the month, although by the end of the month the majority of the grain was thrashed. Considerable fall plowing was done and some fall rye seeded on the stubble ground.

The barge at Station 3 was docked with very little difficulty.

The power plant was operated for the commercial power contract; 91,000 kilowatt-hours of energy were delivered to the city of Williston. This was 8,100 kilowatt-hours more than for August. Nine hundred and thirty-seven tons of coal were mined.—*A. R. Barbour.*

Summary of employees for September, 1921.

Projects.	Beginning of month.	End of month.	Increase.	Decrease.
Washington office.....	86	86		
Denver office.....	88	85		3
Field legal.....	25	25		
Examiner of accounts.....	3	3		
Yuma.....	204	163		41
Yuma Auxiliary.....	52	40		12
Orland.....	21	21		
Grand Valley.....	60	39		21
Uncompahgre.....	65	59		6
Boise.....	175	141		34
King Hill.....	181	154		27
Minidoka.....	133	138	5	
Huntley.....	27	19		8
Lower Yellowstone.....	40	30		10
Milk River.....	109	109		
St. Mary storage (including $\frac{1}{2}$ time of 7 employees on Blackfeet).....	23	31	8	
Sun River.....	54	44		10
North Platte.....	552	457		95
Newlands.....	109	117	8	
Carlsbad.....	20	17		3
Rio Grande.....	629	363		266
Umatilla.....	50	100	50	
Klamath.....	164	142		22
North Dakota Pumping.....	38	33		5
Belle Fourche.....	77	73		4
Strawberry Valley.....	34	32		2
Salmon Lake Dam.....	91	47		44
Okanogan.....	29	6		23
Yakima.....	179	143		36
Tieton Dam.....	324	298		26
Riverton.....	72	85	13	
Shoshone.....	307	299		8
Blackfeet (exclusive of $\frac{1}{2}$ time of 7 employees on St. Mary).....	12	9		3
Flathead.....	84	75		9
Fort Peck.....	18	14		4
Unassigned per diem.....	36	36		
Secondary.....	21	25	4	
Total employees.....	4,192	3,558		
Increase.....			88	
Decrease.....				722
Net decrease.....				634

UMATILLA PROJECT, OREGON.

September was cool, with low precipitation.

Farming operations.—Farming operations were concerned with harvesting the third cutting of alfalfa, irrigation of the pasture crop and harvesting of the apple crop. Fifty-five cars of baled and chopped alfalfa and three cars of apples were shipped during the month. Twelve tons of honey and two carloads of hogs were marketed.

Labor conditions.—There was a slight deficiency in the supply of labor for fall operations, but it seemed probable that this would be changed within a short time.

Operation and maintenance.—The Feed Canal was not operated. At the close of the month there were 3,625 acre-feet of available storage in Cold Springs reservoir, being over 3,000 acre-feet less than for the same date the previous year. The supply was adequate, however, for the demand. From 19 to 184 second-feet, from 9 to 14 second-feet, and from 50 to 120 second-feet were diverted continuously through-

out the month by Canal A, the Maxwell Canal, and the West Extension main canal, respectively. The demand for water decreased materially throughout the month. On the 15th, on the petition of the water users affected, water was cut out of the lower A line and lateral D in order to permit the beginning of construction operations on those lines.

Construction, West Side Division.—On September 22 a small force of men and teams began excavation preliminary to the lining of the old Cabbage lateral. At the close of the month approximately 2,000 cubic yards of class 1 material had been excavated.

East Side Division: On September 15 water was turned out of that portion of the A Canal on which work was planned for this fall, and excavation and enlargement was commenced on the 17th. Truing and preparing of banks was commenced on the 19th, and placing of concrete lining was commenced on the 21st. Good progress was made and at the close of the month 2,000 feet of canal had been lined, involving the placing of 467 cubic yards of concrete. Three thousand cubic yards of material were excavated in enlargement. Sand was delivered by Government forces; gravel was furnished and delivered under contract. One hundred linear feet of 30-inch concrete pipe were laid on D line betterments. On Feed Canal betterments 5 cubic yards of concrete were placed in the raising of the old lining above spillway No. 1, completing the work. In the pipe yard 689 sections of 16-inch concrete pipe and 734 sections of 20-inch concrete pipe were manufactured.—*Maurice D. Scroggs.*

KLAMATH PROJECT, OREGON-CALIFORNIA.

September weather was favorable for all project activities; slight frosts, occurring on the 3d and 20th, did some minor damage to gardens and field crops.

The farmers finished putting up the second cutting of hay. The harvesting of the project grain crop was practically completed and thrashing was in progress. On the Tule Lake leased lands several large combined harvesters were used to advantage.

Water was turned out of the C Canal on the 15th; the balance of the system was operated until the end of the month, when the water was turned out of the system for the season. Four small repair crews were engaged all month in making minor repairs to the distribution and drainage system.

One survey party was engaged all month on survey work in connection with the precast flume on the C Canal and on the structures on the C-G Canal. One field party was engaged during part of the month in making preliminary investigations for a diversion dam on Lost River at the southern end of Langell Valley.

Three drag-line excavators were engaged during the entire month in the construction of the J Canal and in extending the No. 10 drain to Tule Lake. The construction of the J Canal was completed from Station 0 to 35. The canal excavation and the construction of the lower bank were completed from Station 225 to 447, the California-Oregon boundary. Upon completion of the No. 10 drain, work will be begun on the waste ditch parallel to the J Canal and the upper bank of the canal will be constructed with the material excavated.

On the C Canal flume job, a small crew was engaged in the construction of a traveling stiff-leg derrick to be used for dismantling the present timber structure and for erecting the new precast flume. The flume is 4,300 feet long; the precast units consist of 990 flume

sections 11 feet wide, 6 feet high, and 4 feet 3 inches long; 335 sets of stringers, 3 stringers to a set, and 335 bents. Water was turned out of the old timber flume on the 15th and a part of the flume torn down. During the latter part of the month, a short stretch of the new flume was erected, principally to test out the erecting equipment.

On the C-G Canal good progress was made on the Lost River structures. Practically all of the work on the twin and triple pipe lines and the inlet structure on the north side of the river was completed at the end of the month. The Lost River structures on the C-G Canal consist of three pipe lines, each 6 feet 3 inches in diameter. One of the pipe lines crosses the river and supplies the G Canal; one discharges into Lost River, the water being diverted into the J Canal at a point about 15 miles below; the third pipe line is for an emergency spillway to the Diversion Canal.

On the Lower Diversion Dam on Lost River good progress was made by the contractor. The more complicated construction on the north side of the river was completed. Good progress was also made in excavating for the foundation and for the inlet to the J Canal.

The California-Oregon Power Co. employed about 150 men on the construction of the Link River Dam and on the channels above the dam. Good progress was made on all features of this work. At the end of the month, the work remaining to be done on the dam consisted of a weir section about 40 feet long and a gate section of approximately equal length. The total amount of concrete placed to the end of the month amounted to 1,800 cubic yards, and the total excavation to 9,620 cubic yards, all of which was rock. The concrete work was about 85 per cent complete and the rock excavation 50 per cent complete.—*Herbert D. Newell.*

BELLE FOURCHE PROJECT, SOUTH DAKOTA.

September weather was fine for outdoor work. Precipitation amounted to only one-half of an inch, and there were but 5 or 6 cloudy days. A light frost occurred in localities protected from the wind on the morning of the 11th, but did no damage. On the morning of the 30th a rather severe frost occurred which closed the season for corn and nipped all garden stuff.

The harvesting and thrashing of crops were completed, with the exception of beets, which were being marketed rapidly. The corn and hay crops throughout the project were satisfactory, except for the fact that the first cutting of hay was damaged by rain so much that it was unsaleable for shipping. The small grain crop was disappointing, wheat averaging from 10 to 15 bushels and oats from 20 to 30 bushels per acre. Potatoes yielded fairly well, and where properly cultivated and irrigated did exceptionally well.

Project stock was in good condition, and hogs were being prepared for market with corn raised on the project. The price of fat hogs was low, being about 5½ to 6 cents. Some sales of lambs were reported at 4 cents on foot, which was lower than prewar prices. The price of cattle was correspondingly low. With credit facilities unsatisfactory, there was grave doubt as to whether sufficient stock could be secured to consume the forage on the project this winter.

Water was run in the canals continuously up to the 25th of the month, when the South Canal head gate was closed for the season. The North Canal gate was closed on the morning of the 26th. The demand for

water up to the 10th was more than usually heavy; after that date little water was required. Application was made by a few of the water users for the operation of the ditches until October 15, but it was not considered feasible to do so. During the last half of the month only a portion of the river flow was taken into the Inlet Canal. This was used for irrigation along the Inlet Canal and Johnston Lateral.

Work was in progress setting the two cast-iron gates for the Inlet Canal drop, and this work was completed on the 30th. In the Newell district a few wooden structures were placed on the lateral system and 600 cubic yards of earth back filled over the Deer Creek siphon; about 3 miles of telephone line were taken down and rebuilt in a better location, fourteen 46-inch concrete pipe were hauled out to the main canal north of Newell for use as a culvert at Mile 37.7, and ten 46-inch concrete pipe were made for replacing the decayed portions at both ends of the Dennis siphon at Newell. In the Vale district a crew of 10 men was employed in replacing lateral structures and hauling gravel for concrete chutes. Two concrete chutes were constructed on the Berry Lateral, and four farm turnouts and a check were replaced. Work was in progress on replacing two wooden drops with concrete structures, according to Denver office plans. The Ruth dredger was operated throughout the month, and cleaned a total of $8\frac{1}{2}$ miles of lateral from one side only. The amount of yardage moved, estimated from measurements made at several places, appeared to be about 8,900 cubic yards. It is believed, however, that this estimate, as made by the Irrigation Manager, is large. The drag-line excavator continued work on the Lewis cut until the 10th, after which it moved up the canal and cleaned 1,300 linear feet in the vicinity of the Anderson siphon. This work consisted of shaping up a severely eroded bank and cleaning about 1,900 yards of material out of the canal.—*B. E. Hayden.*

STRAWBERRY VALLEY PROJECT, UTAH.

September weather was generally fair and warm with subnormal precipitation.

Farming operations.—The continued warm weather greatly benefited all crops. The thrashing of grain crops and the cutting of the third crop of alfalfa were completed. The peach and tomato crops were marketed and picking of the apple crop had started. Harvesting of the sugar beet and potato crops will begin about the 1st of October. Excellent yields of all agricultural products were obtained, though prices were low and demand was unstable. The sugar-beet factories were expected to commence their fall campaign on October 5.

Hydrometric data.—The High Line Canal on the last day of the month was carrying 170 second-feet of water, and the Spanish Fork River approximately 110 second-feet. A total of 13,800 acre-feet of water was delivered from Strawberry Reservoir for irrigation purposes; 9,100 acre-feet were delivered to the High Line Division; 3,770 to the Spanish Fork Division, and 930 to the Springville and Mapleton Irrigation Districts. The total amount of water delivered to the various divisions of the project from all sources was approximately 25,000 acre-feet, of which amount 11,200 acre-feet were delivered from the Spanish Fork River.

Labor.—The labor situation continued satisfactory throughout the month.

Operation and maintenance, storage system.—The usual patrol work was done, and general supervision

given all structures comprising the storage works of the project by the regular forces at East Portal.

Quarry operations continued at West Portal, and 150 cubic yards of rock were obtained. The crushing plant at West Portal was in operation 12 days, and 150 cubic yards of sand and 150 cubic yards of blue rock were crushed and placed in storage.

Grazing lands in Strawberry Valley maintained an average of 10,000 head of cattle and sheep, and the lands and stock were in excellent condition.

Operation and maintenance, power system.—The power plant was operated without interruption and power furnished to the towns of Spanish Fork, Payson, Salem, and Springville. The Power Canal and Spanish Fork Diversion Dam were operated without trouble, and all water required for irrigation and power purposes delivered.

Transmission and telephone lines rendered good service.

General.—Freighting operations between Diamond Switch and West Portal were continued, and approximately 80 tons were delivered.

A serious cloud-burst washed out a portion of the concrete lining on the lower end of Lateral 33 as well as several sections of metal flume near Turnout G on Lateral 34.—*W. L. Whittemore.*

OKANOGAN PROJECT, WASHINGTON.

September weather was cool, with a little frost about the middle of the month. The three pumping plants were closed down for the season in the following order: Duck Lake on the 13th, Salmon Lake on the 16th, and the electrical plant, or Robinson Flat, on the 22d. The building at the Duck Lake Pumping Plant caught fire from the exhaust from the engine and burned to the ground on the evening of September 13, about 12 hours ahead of the time that it was planned to close the plant down for the season. Little damage was done to the machinery, but considerable time in the making of repairs was found necessary. A new building will be erected next spring.

The Project Distribution System was operated continuously up to the 25th, when it was closed down for the year, water being shut off at Conconully on the evening before. The master mechanic, with 1 to 4 men, made repairs to the machinery and to the Duck Lake Plant. A crew was engaged on maintenance work until the middle of the month, and then worked at the Duck Lake Pumping Plant, being laid off at the end of the month. The office force kept up the routine work, and completed the project assessment roll. The project was visited by Consulting Engineer D. C. Henny, September 20-22, who went into the matter of project water supply and the run-off of Salmon Creek, and met with the Board of Directors to discuss these items and the possibility of a pumping plant to furnish a supplemental supply for the project.—*Calvin Casteel.*

YAKIMA PROJECT, WASHINGTON.

September weather was characterized by temperatures and precipitation below the average. A killing frost occurred on the 12th, this being the earliest since 1895, when frost occurred on September 9.

Construction.—Piling and burning of logs and debris at the lower end of Lake Keechelus continued throughout the month, the crew consisting of 38 men at the beginning of the month and 20 at the close.

Operation and maintenance.—Sunnyside Division: Average diversion into Sunnyside main canal for

September was 950 second-feet; the maximum was 1,200 second-feet, at the beginning of the month, gradually decreasing with the demand for water to 700 second-feet at the close of the month. An average of 86 second-feet was wasted to provide sufficient power water for the pumping plants. About 6 second-feet were wasted in regulation at the end of the main canal. Two maintenance crews were engaged in grubbing willows on main and branch canals, and on repair and replacement of irrigation structures.

Tieton Division.—The average diversion into Tieton main canal was 255 second-feet. Maximum diversion of 320 second-feet was maintained until the 10th, gradually decreasing to 140 second-feet at the close of the month. A test of the Tieton main canal on the 9th indicated a carrying capacity of 335 second-feet to the outlet of Tieton tunnel, the section of open canal and the entrance to North Fork tunnel apparently being the obstacles preventing a delivery of the extra 15 second-feet to the project. Maintenance crews were engaged on enlargement of cistern at headquarters, hauling coal and lumber, and delivering material for lining on Lateral L. At Bumping Lake a crew of 16 men and 2 teams was at work piling logs and debris.

Storage reservoirs.—Release of storage for irrigation purposes continued to the 21st. After that date storage water was released to accommodate logging crews, and to regulate the reservoirs for winter storing.

New divisions.—The field party completed surveys for the Roza Division on September 3.

Visitors.—The committee appointed to look into business methods of the service, with a view to im-

provement and economy, was in session at Yakima September 26 to 28, project managers and chief clerks from the Umatilla, Okanogan, and Klamath projects, and District Counsel Holgate also being in attendance.—*J. L. Lytel.*

TIETON DAM.

September weather was ideal for construction work. The excavation of the diversion tunnel was about completed at the end of September, and it is expected to divert the river late in October. Good progress was made both in excavation and placing of concrete in the corewall. It is expected that all excavation and concreting in the corewall below ground, except the river section, will be completed before heavy snows come, leaving the river section for winter work. Sand, gravel, and cement were stored and other preparations made for winter work on the river section. The freighting contractor hauled in an average of 50 tons per day, consisting largely of cement. Labor was plentiful, but more on the move than at any time during the season.—*C. E. Crownover.*

RIVERTON PROJECT, WYOMING.

September weather was favorable for construction, and the temperature was about normal. The precipitation was 0.12 inch, which was much less than usual for September. The roads were in good condition throughout the month. The flow of Wind River was about 25 per cent less than normal.

Dragline No. 121322 was operated two shifts throughout the month, excavating from earth section of Wyoming Canal. The material was mostly a hard

Comparison between operation and maintenance estimates and results, Jan. 1 to Sept. 30, 1921.

Project.	Gross cost.				Accruals.				Area which can be irrigated in 1921.
	Estimate for 1921.		Actual cost to Sept. 30.	Amount *over or under.	Estimate for 1921.		Actual returns to Sept. 30.	Amount more or *less than estimate.	
	Total for year.	To Sept. 30.			Total for year.	To Sept. 30.			
Belle Fourche.....	\$118,500	\$102,000	\$105,000	*\$3,000	\$148,000	\$147,000	\$147,000	.....	Acres.
Boise.....	345,000	252,000	290,000	*\$38,000	321,500	312,000	288,000	*\$24,000	82,800
Carlsbad.....	50,000	40,000	40,600	*600	52,000	49,500	52,600	3,100	165,800
Grand Valley.....	60,000	42,000	47,100	*5,100	61,400	49,700	48,000	*1,700	25,000
Huntley.....	75,000	56,200	51,500	4,700	88,600	88,600	63,200	*25,400	38,350
King Hill ¹	29,000				29,000				31,300
Klamath.....	75,000	63,000	62,600	400	87,900	87,900	86,400	*1,500	16,000
Lower Yellowstone.....	66,000	53,000	47,500	5,500	66,000				52,500
Milk River.....	90,000	69,000	66,500	2,500	45,000	45,000	14,200	*30,800	38,700
Minidoka (south side).....	134,000	101,000	87,500	13,500	134,000	130,000	115,000	*15,000	² 74,500
Newlands.....	118,700	94,500	92,000	2,500	120,600	115,500	115,000	*500	49,000
North Dakota Pumping.....	59,050	51,000	39,200	11,800	26,800	26,800	26,800	.....	69,300
North Platte—Interstate.....	275,000	230,000	239,000	*9,000	342,800	298,000	270,000	*28,000	³ 129,900
North Platte—Fort Laramie.....	63,000	55,500	36,800	18,700	35,000	33,000	25,500	*7,500	14,000
Okanogan.....	35,000	29,500	36,500	*7,000	41,700	40,000	43,500	3,500	8,000
Orland.....	35,000	23,000	30,000	*7,000	41,200	41,200	41,800	600	20,500
Rio Grande.....	242,500	216,000	200,000	16,000	249,000	233,000	195,000	*38,000	118,000
Shoshone.....	108,600	87,600	74,000	13,600	126,000	126,000	116,000	*10,000	65,800
Strawberry Valley ⁴	30,000	20,600	22,400	*1,800	60,300	60,300	51,800	*8,500	59,100
Sun River—Fort Shaw.....	20,000	17,500	16,200	1,300	26,400	26,400	25,600	*800	12,200
Sun River—Greenfields.....	25,000	25,000	32,800	*7,800	15,000	15,000	21,000	6,000	25,100
Umatilla.....	53,000	44,700	42,000	2,700	53,000	50,500	51,000	500	26,300
Uncompahgre.....	145,000	108,000	123,000	*15,000	152,300				100,000
Yakima—Sunnyside.....	135,000	102,000	102,000	.....	150,500	134,000	135,000	1,000	110,800
Yakima—Tieton.....	92,000	64,000	66,000	*2,000	103,200	111,000	105,000	*6,000	32,000
Yuma.....	233,000	188,000	268,000	*80,000	300,000	265,000	224,000	*41,000	61,300
Total.....	2,712,350	2,135,100	2,218,200	*\$83,100	2,877,200	2,485,400	2,261,400	*\$224,000	1,433,900

¹ Report not received from project in time for publication.

² Stored water is furnished through St. Mary Canal for 21,600 acres additional.

³ Includes 17,000 acres for which water is carried in main canal.

⁴ Does not include Strawberry Tunnel repairs.

dense clay, part of which was classified. A small amount of sandstone was encountered at the end of the month.

Dragline No. 121474 was operated two shifts throughout the month, excavating gravel and cobbles for the lined section of the Wyoming Canal near Mile 6.

The total amount of material excavated from the canal was 66,645 cubic yards, of which 65,895 cubic yards were excavated from the canal prism. Of this material 47,448 cubic yards were Class 1, partly heavy gravel and partly a clay loam, and 18,447 cubic yards Class 2 material, a hard, dense clay.

Dragline No. 121323 was operated two shifts throughout the month, working at the diversion dam site most of the time, and making excavation and moving gravel for concrete.

The excavation for the headworks was completed, that for the sluiceway nearly completed, and some excavation was done for the weir. The concrete in the foundation of the headworks was practically completed, and the concrete floor for the silt basin was nearly completed. The building of the construction plant and the assembling of materials was continued. In excavating for the site 3,695 cubic yards of gravel and 403 cubic yards of sandstone were moved; 73 cubic yards of plain concrete and 221 cubic yards of reinforced concrete were placed.

The construction of a small camp at Pavillion was in progress, and work was begun early in the month on the drilling of a well by contract for this camp. A survey party will be located at this point early in October locating Wyoming Canal from Pilot Butte to Five-Mile Creek.

Among the visitors to the project during the month were the Secretary of the Interior and the director and their party on September 22.—*H. D. Comstock.*

SHOSHONE PROJECT, WYOMING.

September was a pleasant month, well suited to outside work and harvesting of crops. A severe windstorm on the 28th did some damage to haystacks and filled some of the laterals with weeds and sand.

Water supply.—The Shoshone River was at a low stage the entire month, and the water surface in Shoshone Reservoir dropped gradually throughout the month.

Operation and maintenance.—The principal work during the month was on the operation of the canal system; 22,683 acre-feet were diverted from the river, of which 9,315 were delivered to the farmers for the irrigation of 21,000 acres. September water consumption was below normal, in part due to the advanced stage of crop growth. Maintenance work was very light, and consisted principally of repairs to minor structures made by the operation crews. The Austin Machinery Co. continued its test of a ditch-cleaning machine.

Crops.—The farmers were busy harvesting crops. A considerable number were engaged on the third cutting of alfalfa. Thrashing of grain was well advanced, and the harvesting of sugar beets and potatoes was also begun near the close of the month. Indications were that sugar beets would yield slightly more per acre than last season, but that the yield of potatoes per acre would be slightly lower, although of much better quality. The following shipments were made from the project: Sweet-clover seed, 1 car; honey, 1; sugar beets, 79; potatoes, 60; and wheat, 47.

The alfalfa mill at Powell contracted for about 500 tons of alfalfa hay at \$5 a ton delivered at the mill, but had not yet begun grinding.

Labor.—Labor was rather scarce during the latter part of the month, owing to the requirements of the farmers and the sugar-beet factory, but there was no increase in the price of labor.

Drainage.—The following tabulation shows the progress of drainage excavation during the month:

Machine.	Number and size of bucket.	Area.	Linear feet.	Cubic yards.	Shifts.
Bucyrus, 9 $\frac{1}{2}$.	121324; 1 $\frac{1}{2}$ yds.	North Garland.	5,114	31,773	47
Do.....	11128; 1 $\frac{1}{2}$ yds...	Frannie, part 1.	3,010	18,760	35
Bucyrus, 14.	121472; 2 $\frac{1}{2}$ yds.	North Garland.	5,940	39,765	39
Do.....	121475; 2 $\frac{1}{2}$ yds.	Frannie, part 1.	1,335	30,078	48
Lidgerwood.	113210; 1 yd....	South Garland.	3,487	15,446	40
P. & H.....	121161; $\frac{1}{2}$ yd....	North Garland.	3,380	13,513	44
Do.....	121153; $\frac{1}{2}$ yd....	Frannie, part 1.	(1)	4,655	23
Total.			22,266	153,990	276

¹ Recut.

Field and office engineering.—Field work was carried on by two crews on the Garland Division and one crew on the Frannie Division. One crew on each division was engaged upon work in connection with drainage. The other crew on the Garland Division was engaged principally upon work in connection with the location of the transmission line. Office work was mostly incidental to the above field work, and work in connection with settlement and studies of the location of the first 6 miles of the Willwood Canal.

Construction.—Construction work on the Garland and Frannie Divisions was mostly in connection with drainage. The work of priming and puddling the canals and laterals of the lands open to settlement in the Frannie Division during the month was about completed. At Shoshone Dam the principal work was on the concreting of the power house and the power tunnel. The excavation of the by-pass tunnel was advanced 33 feet. Nine hundred and five cubic yards of concrete were placed in the power house, and 325 cubic yards in the power tunnel. Materials were arriving and an organization was being assembled for the construction of the transmission line.

Settlement.—The opening of Part Four, Frannie Division, and Part Eight, Garland Division, took place September 16. There were 57 public-farm units in the lands to be opened and 143 water-right applications at the drawing, covering 40 of the units. Since that time water-right applications have been received on all but three of the remaining units.

The Northwestern Wyoming State Fair was held at Powell September 13 to 16. Although this was a new enterprise the results were gratifying and it is planned to make the fair an annual event on the project.

Visitors.—Secretary Fall and a party consisting of his private secretary and several Chicago, Burlington & Quincy R. R. officials visited the project on the 17th and 18th. The director arrived on the project in advance of the party on the 14th. Senator John B. Kendrick, Representative F. W. Mondell, and Gov. Carey were also visitors on the project during the week of the fair.—*J. D. Longwell.*

INDIAN PROJECTS, MONTANA.

BLACKFEET PROJECT.

September weather was rather unfavorable for both operation and maintenance and farming operations.

There were several snow and rain storms, and the winds were exceptionally bad.

The two larger systems of the project were operated at part capacity during the entire month. The latter part of the month the demand for fall irrigation was increasing, and it is probable that during the first part of October considerable irrigation will be done. The maintenance work consisted of cleaning and repairing laterals, cutting brush from canal banks, and similar work.

At the end of the month practically all of the crops were harvested, except some late flax and some other grain crops that were planted for hay. Crops in general were not up to expectations, and the wheat yield, which, as usual, was the principal crop, was rather light.—*R. M. Snell*.

FLATHEAD PROJECT.

Work under Contract 858 consisted of finishing canal section and placing concrete lining between stations 268+74.3 and 267+50.0; 263+07.5 and 261+00.0, and 253+48.4 and 249+90.3, totaling 691.8 linear feet, allowing for overlap in stationing, or 9,958 square feet of concrete.

Thrashing of spring and winter wheat was about completed. Harvesting of potato crop was started during latter part of month.

Live-stock conditions continued very good.—*C. J. Moody*.

FORT PECK PROJECT.

September weather was only fairly favorable for construction work, being wet and cloudy with bad winds. The precipitation, which was 1.62 inches, softened the ground so that considerable plowing was in progress at the end of the month. Irrigation was confined to a small acreage of alfalfa and some native hay and pasture.

The construction force completed the siphon at Station 628, Poplar River C Canal, and moved to the Big Muddy Division, where it nearly completed repairs to and extension of paying below Homestead Diversion Dam. The P. & H. drag line worked throughout the month cleaning Poplar River C Canal.

Thrashing, though delayed by the bad weather, was practically completed. The third cutting of alfalfa was also harvested during September.—*S. A. Kerr*.

GENERAL OFFICES.

Washington office.—The director was in the field the entire month, a large part of his time being spent in the company of the Secretary in an inspection of the projects. During his absence the office was in charge of Assistant Director Morris Bien as acting director. During the absence of Mr. Bien on September 22 and 23 the office was in charge of Chief Counsel Ottamar Hamele as acting director.

J. B. Beadle, director's assistant, left for Denver on September 3 to attend a series of meetings as a member of a committee appointed by the director to investigate present business methods of the Reclamation Service, in order to see if its efficiency can be increased. A number of statements on costs and economies were prepared for his use.

On September 1 E. G. Paul, engineer, for 28 years an employee of the Government, who served for a number of years most efficiently as chief clerk of the Washington office, was placed on the retirement roll on account of continued ill health. Mr. Paul left the service with the best wishes of all with whom he came in contact during his period of service and with many

expressions of appreciation from the administrative officers of the service for the part he played in helping to lay the foundations for the successful administration of the work under his charge. Mr. Paul was presented by the Washington office employees with a gold watch, suitably engraved.

On September 5 Chief Accountant A. H. Gullickson left the service by transfer to the Internal Revenue Bureau to the position of assistant supervisor of collectors' offices. Mr. Gullickson made a record for ability and efficiency in the position of chief accountant and his transfer is a material loss to the service. Pending the appointment of his successor, C. A. Lyman is acting chief accountant.

Statistician C. J. Blanchard and Photographer R. B. Dame left for the North Platte and Shoshone projects early in the month to attend the openings of public land on these projects on September 9 and 16, respectively, for the purpose of securing moving and still pictures of scenes at the openings and scenes showing new developments on each of the projects, with particular reference to farms filed on by ex-service men at the openings in March, 1920. They returned to the office the latter part of the month with a large number of interesting pictures.

Action was taken by the Secretary on the following matters submitted to him:

September 1, recommending fixing of 160 acres as the size of all farm units on the Milk River project; approved September 1.

September 13, recommending approval as to form of draft of contract between the United States, the Grand Valley Water Users' Association, and the Orchard Mesa Irrigation District, providing for the reconstruction of the Orchard Mesa project; approved September 14.

September 15, recommending signing of contract with the Boise-Mora Irrigation District and the Hillcrest Irrigation District, for the purchase by the districts of an interest in the storage capacity of Arrowrock Reservoir, Boise project, the construction of a pumping plant or plants and a canal system, and use by the districts of the Boise power plant, the total amount involved being \$1,458,600; approved September 16.

September 17, recommending approval as to form of supplemental contract with the Okanogan Irrigation District, providing for the expenditure of not to exceed \$150,000 by the United States in the completion of Salmon Lake Dam and Reservoir, the installation of pumping plants, the construction of additional laterals, and in betterments and reconstruction of the Okanogan project system; approved September 19.

September 23, recommending approval as to form of draft of water-rental contract with each of the canal companies and irrigation districts in the Chinook Division, Milk River project, providing for payment each year of their proportionate part of the actual cost of operation and maintenance as determined at the end of each calendar year; approved September 24.

The work of assembling and editing copy for the twentieth annual report was completed during the month and the manuscript sent to the printer.

Among the visitors to the office were C. C. Inglis, engineer of the British Government at Poona, India, who plans to make an extensive study of irrigation as practiced in this country and who probably will visit a number of our projects on his trip; and H. F. Parsons, manager of the Farmers' Irrigation District, adjacent to the North Platte project.

Denver office.—Chief Engineer Weymouth joined the Secretary's party at Baker, Oreg., on September 2, and with the Secretary and Director visited the Boise and Minidoka projects. From American Falls the Chief Engineer returned to the Denver office on the 8th. On the 22d the Chief Engineer and District Counsel Roddis left for Casper, Wyo., for a conference with the Secretary and Director. From Casper the Chief Engineer went to Idaho. Assistant Chief Engineer Walter and Designing Engineer Savage left Denver on the 22d for California, to confer with interested parties relative to the proposed contract covering Shasta Valley Investigations, after which they proceeded to the Klamath project. Official visitors during the month included Secretary Fall, Director Davis, and Messrs. H. J. Gault, J. B. Beadle, W. J. Eggleston, P. W. Dent, and Barry Dibble.

The principal work accomplished in the Designing Division during the month consisted of the preparation of designs for drop in Two Medicine Canal, and gates for Four Horns Reservoir, Blackfeet project; preliminary designs and estimates for Benham Falls Reservoir hydraulic fill dam, and miscellaneous structures, Deschutes project; preliminary designs and estimates for Flaming Gorge, Juniper, Dewey, and Boulder Canyon reservoirs, Colorado River Storage project; detail design of proposed office building, Fort Peck, project; preliminary designs for Green River Diversion Dam and for structures at proposed pumping plant, Green River project; the review of specifications and drawings for proposed Orchard-Mesa Irrigation District, Grand Valley project; the preparation of preliminary designs and estimates for various heights of dams on Lost River, and also for miscellaneous structures for the Langell Valley Division, Klamath project; the completion of designs for King Hill siphon and Big Alkali Creek flume, King Hill project; the preparation of maps and draft of specifications of structures and designs for culverts and siphons, Lower Yellowstone project; designs of special measuring device and miscellaneous structures, Milk River project; detail design of Main Canal check, Minidoka project; irrigable area maps, Owens Valley project; watershed tracing, Owyhee project; preliminary design and estimate for concrete-faced earth dam, Alamo Gordo Reservoir, Pecos River project; tracings of gates and machinery and preliminary estimates and designs for Wind River Diversion Dam, Riverton project; review of designs of Thompson Valley Dam and Diversion Dam, Silver Lake Irrigation District; detail designs for the domestic water supply system, Uncompahgre project; preliminary designs and estimates of various types of outlet works for Tieton Dam, Yakima project; and advertisement and specifications for purchase of gates, Yuma Mesa Division. Work was continued on standardization drawings for lock joint concrete pipe forms, precast structures, and gates. Inspection was performed of materials purchased under 13 Denver office advertisements.

The principal work accomplished in the Electrical Division during the month consisted of the preparation of abstract of bids received for direct pumping units for the Thomas Point Pumping Plant, Lower Yellowstone project; advertisement for compound lathe rest and general design of turning device in connection with the generator shafts, Minidoka Power House, Minidoka project; drafts of specifications for sale of power and contract for Union Pacific Railroad crossing under Fort Laramie transmission line, North Platte project; estimates of cost of power development at Pilot Butte, Riverton project; design

of transmission line and superstructure for Shoshone Power Plant, advertisements for roof trusses and drawings of the 36-inch regulating outlet, Shoshone project; estimate of small direct pumping plant, Uncompahgre project; drawings of general arrangement B-Lift Pumping Plant, Yuma Auxiliary project; preliminary drawings and estimates of direct pumping plant, Green River project; preliminary designs for electrification of Bucyrus excavator, and specifications for motor, controller and transformers, Denver office.

In the Legal Division the Orchard-Mesa contract negotiations were continued and form of contract submitted to the Water Users' Association. At a conference in Casper, Wyo., on the 23d, between the Secretary of the Interior, the Director, the Chief Engineer, and District Counsel Roddis, it developed that the contract with the Orchard-Mesa District should not become effective until approved by Congress. District Counsel Roddis was on the Riverton project the last week of the month.

An average of 411 letters per day were received during the month; 1,153 vouchers were handled, involving a total amount of \$279,358.06. In the Purchasing Division 351 advertisements were issued and 595 vouchers prepared, involving a net expenditure of \$169,198.27. Transfers were effected between the projects amounting to \$6,503.04.—*Chas. P. Williams.*

BULLETINS FOR THE FARMER.

Distributed by the Department of Agriculture,
Washington, D. C.

FARMERS' BULLETINS.

No.

553. Pop corn for the home.

1199. Judging sheep.

1219. Floors and floor coverings.

DEPARTMENT BULLETINS.

Bulletin No.

958. Development of tubers in the potato.

999. Prices of farm products in the United States.

Distributed by State Experiment Stations.

TUCSON, ARIZ.

Circular No.

35. Sudan grass in Arizona.

36. Rhodes grass in Arizona.

37. The production of clean milk.

38. The adobe milkhouse.

39. Selecting laying hens.

40. Experiment Station regulations under Arizona uniform seed law.

41. Poultry-breeding contest.

LOGAN, UTAH.

Circular No.

44. The agriculture of Utah.

45. Alfalfa production under irrigation.

46. Thirty years of agricultural experiments in Utah.

ADMINISTRATIVE ORGANIZATION.

DEPARTMENT OF THE INTERIOR.

Hon. ALBERT B. FALL, Secretary of the Interior.
 EDWARD C. FINNEY, First Assistant Secretary.
 FRANCIS M. GOODWIN, Assistant Secretary.
 EDWIN S. BOOTH, Solicitor for the Interior Department.
 CHARLES V. SAFFORD, Administrative Assistant to the Secretary.
 CHARLES W. NESTLER, Administrative Assistant to the Secretary.
 HARRY G. CLUNN, Private Secretary to the Secretary.
 JOHN HARVEY, Chief Clerk and Superintendent of Buildings.

U. S. RECLAMATION SERVICE.

WASHINGTON, D. C.

Arthur Powell Davis, director; Morris Bien, assistant director; Ottamar Hamele, chief counsel; J. B. Beadle, director's assistant; C. J. Blanchard, statistician; Hugh A. Brown, editor and office assistant; C. A. Bissell, engineer; _____, chief accountant; Miss H. A. Fellows and Raymond Depue, fiscal agents; C. H. Fitch, chief clerk; Emmet Carr, purchasing agent; G. W. Numbers, appointment clerk; H. N. Bickel, Yakima, Wash.; W. A. Meyer, Denver, Colo., and W. F. Kubach, Great Falls, Mont., examiners of accounts.

DENVER, COLO.

F. E. Weymouth, chief engineer, Tramway Building, Denver, Colo.; R. F. Walter and C. P. Williams, assistant chief engineer; Miss L. H. Meisel, secretary to the chief engineer; J. M. Gaylord, electrical engineer; J. L. Savage, designing engineer; James Munn, engineer; J. L. Burkholder, drainage engineer; W. L. Drager, office engineer; J. M. Luney, chief clerk; A. McD. Brooks, purchasing agent; Harry Caden, special fiscal agent.

FIELD LEGAL OFFICES.

Boise, Idaho.—B. E. Stoutemyer, district counsel. Projects: Boise, Minidoka, King Hill, and Jackson Lake Enlargement; R. M. Patrick, district counsel, located at American Falls, Idaho.

Denver, Colo.—Law section office of chief engineer; E. E. Roddis and Armand Offutt, district counsel; J. J. Buck, assistant district counsel.

El Paso, Tex.—P. W. Dent, district counsel. Projects: Rio Grande, Carlsbad, and Hondo.

Las Cruces, N. Mex.—Mark B. Thompson, attorney in charge of litigation on Rio Grande and Carlsbad projects.

Helena, Mont.—W. J. Eggleston, district counsel, Helena, Mont. Projects: Blackfeet, Flathead, Fort Peck, Huntley, Milk River, St. Mary Storage, Sun River, North Dakota Pumping, Lower Yellowstone, and Shoshone.

Mitchell, Nebr.—J. N. Beardslee, district counsel. Projects: North Platte and Belle Fourche.

Montrose, Colo.—J. R. Alexander, district counsel. Projects: Grand Valley, Uncompahgre, and Strawberry Valley.

Portland, Oreg.—H. L. Holgate and D. G. Tyree, district counsel. Projects: Yakima, Okanogan, Umatilla, and Klamath.

San Francisco, Calif.—Henry A. Cox and A. B. Fullerton, district counsel, 349 Pacific Building. Projects: Salt River, Yuma, Orland, and Newlands.

PROJECT ORGANIZATION.

Belle Fourche Project.—B. E. Hayden, project manager, Newell, S. Dak.; R. C. Walber, chief clerk; August Lewin, fiscal agent.

Boise Project.—J. B. Bond, project manager, Boise, Idaho; E. R. Mills, chief clerk; C. F. Weinkauff, fiscal agent.

Carlsbad Project.—L. E. Foster, project manager, Carlsbad, N. Mex.; V. L. Minter, chief clerk and fiscal agent.

Grand Valley Project.—S. O. Harper, project manager, Grand Junction, Colo.; G. H. Murphy, chief clerk; A. H. Hall, fiscal agent.

Huntley Project.—A. R. McGinness, project manager, Ballantine, Mont.; G. H. Bolt, chief clerk; Miss M. C. Simek, fiscal agent.

King Hill Project.—Walter Ward, project manager, King Hill, Idaho; T. W. Hause, chief clerk; L. D. Eakin, fiscal agent.

Klamath Project.—H. D. Newell, project manager, Klamath Falls, Oreg.; N. G. Wheeler, chief clerk; G. R. Barnhart, fiscal agent.

Lower Yellowstone Project.—L. H. Mitchell, project manager, Savage, Mont.; C. A. Denman, chief clerk.

Milk River Project.—G. E. Stratton, project manager, Malta, Mont.; E. E. Chabot, chief clerk; G. S. Moore, fiscal agent.

Minidoka Project.—Barry Dibble, project manager, Burley, Idaho; Dana Templin, engineer; E. C. Diehl, chief clerk; Miss A. J. Larson, fiscal agent; F. A. Banks, engineer, American Falls, Idaho.

Newlands Project.—J. F. Richardson, project manager, Fallon, Nev.; A. W. Walker, engineer; G. B. Snow, chief clerk and fiscal agent.

North Dakota Pumping Project.—W. S. Arthur, project manager and chief clerk, Williston, N. Dak.; H. C. Melias, fiscal agent.

North Platte Project.—Andrew Weiss, project manager, Mitchell, Nebr.; H. W. Bashore, engineer, Fort Laramie Division; Paul Rothl, irrigation manager; J. R. Ummel, chief clerk; Miss A. L. Ferrine, fiscal agent.

Okanogan Project.—Calvin Casteel, project manager, Okanogan, Wash.; W. D. Funk, chief clerk and fiscal agent.

Orland Project.—R. C. E. Weber, project manager, Orland, Calif.; E. T. Ericksen, engineer; C. H. Lillingston, chief clerk and fiscal agent.

Rio Grande Project.—L. M. Lawson, project manager, El Paso, Tex.; T. W. Parry, irrigation manager; C. A. Peavey, chief clerk; L. S. Kennicott, fiscal agent.

Riverton Project.—H. D. Comstock, project manager, Riverton, Wyo.; R. M. Conner, engineer; G. H. Baird, chief clerk; J. C. Thrallkill, fiscal agent.

St. Mary Storage Division.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk; H. E. Bruce, fiscal agent.

Salt River Project.—Being operated by the Salt River Valley Water Users' Association; C. C. Cragin, general superintendent and chief engineer, Phoenix, Ariz.

Shoshone Project.—J. S. Longwell, project manager, Powell, Wyo.; J. R. Iakisch, engineer; C. M. Jump, superintendent of irrigation; W. F. Sha, chief clerk; Miss L. C. Drinkwater, fiscal agent.

Strawberry Valley Project.—W. L. Whittemore, project manager, Provo, Utah; J. E. Overlade, chief clerk and fiscal agent.

Sun River Project.—G. O. Sanford, project manager, Great Falls, Mont.; H. W. Johnson, chief clerk; Miss M. G. Valentine, fiscal agent; G. A. Benjamin, irrigation manager, Fairfield, Mont.

Umatilla Project.—H. M. Schilling, project manager, Hermiston, Oreg.; M. D. Scroggs, superintendent of irrigation; G. C. Patterson, chief clerk and fiscal agent.

Uncompahgre Project.—L. J. Foster, project manager, Montrose, Colo.; A. H. Peach, chief clerk and fiscal agent.

Yakima Project.—J. T. Lytel, project manager, Yakima, Wash.; R. K. Cunningham, chief clerk; J. C. Gawler, fiscal agent; J. G. Heinz, engineer, Sunnyside, Wash.; J. S. Moore, superintendent of irrigation, Naches, Wash.; F. T. Crowe, engineer in charge construction Tieton Dam, Rimrock, Wash.; C. E. Crownover and C. F. Gleason, engineers; V. G. Evans, chief clerk; C. B. Funk, fiscal agent.

Yuma Project.—P. J. Preston, project manager, Yuma, Ariz.; R. M. Priest, superintendent of construction; S. A. McWilliams, engineer, Yuma Mesa Division; E. R. Scheppelmann, chief clerk; E. M. Phillebaum, fiscal agent.

INDIAN PROJECTS.

Blackfeet Project.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk and fiscal agent.

Flathead Project.—C. J. Moody, project manager, St. Ignatus, Mont.; N. B. Hunt, engineer; J. M. Swan, chief clerk; J. P. Siebeneicher, fiscal agent.

Fort Peck Project.—S. A. Kerr, project manager, Poplar, Mont.; Henry Berryhill, chief clerk and fiscal agent.

GOVERNMENT OF THE UNITED STATES

LEGISLATIVE BRANCH CONGRESS

SENATE

96 SENATORS

HOUSE OF REPRESENTATIVES

435 REPRESENTATIVES:

2 DELEGATES:

3 COMMISSIONERS

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DIVISION OF FAR EASTERN AFFAIRS
DIVISION OF NEAR EASTERN AFFAIRS
DIVISION OF LATIN-AMERICAN AFFAIRS
DIVISION OF MEXICAN AFFAIRS

CONSULAR BUREAU
DIVISION OF FOREIGN INTELLIGENCE
OFFICE OF FOREIGN TRADE ADVISOR
DIVISION OF PASSPORT CONTROL
DIVISION OF RUSSIAN AFFAIRS
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DIVISION OF LOANS AND CURRENCY
REGISTER OF THE TREASURY
DIV. PUBLIC DEBT ACCTS. AND AUDIT
SAVINGS DIVISION
COMMISSIONER OF ACCTS. AND DEPOSITS
DIV. OF BOOKKEEPING AND WARRANTS
DIVISION OF DEPOSITS
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COMPTROLLER OF THE UNITED STATES
BUREAU OF THE BUDGET
MINT BUREAU

FEDERAL FARM LOAN BUREAU
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GOVERNMENT ACTUARY
DIVISION OF FOREIGN LOANS
ADVANCES & LOANS TO RAILROADS DIV.
BUREAU OF ENGRAVING AND PRINTING
GENERAL SUPPLY COMMITTEE
BUREAU OF THE PUB. HEALTH SERVICE
SUPERVISING ARCHITECT'S OFFICE
THE COAST GUARD
BUREAU OF INTERNAL REVENUE
CUSTOMS DIVISION

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OFFICE OF CHIEF OF COAST ARTILLERY
MILITIA BUREAU
OFFICE OF ADJUTANT GENERAL
OFFICE OF INSPECTOR GENERAL
OFFICE OF JUDGE ADVOCATE GENERAL
OFFICE OF QUARTERMASTER GENERAL
OFFICE OF CHIEF OF FINANCE
OFFICE OF SURGEON GENERAL

OFFICE OF CHIEF OF ENGINEERS
BD. OF ENGRS. RIVERS & HARBORS
OFFICE PUBLIC BLDGS. & GROUNDS
MISSISSIPPI RIVER COMMISSION
CALIFORNIA DEBRIS COMMISSION
OFFICE OF CHIEF OF ORDNANCE
OFFICE OF CHIEF SIGNAL OFFICER
OFFICE OF CHIEF OF AIR SERVICE
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DOMINICAN RECEIVERSHIP
CHEMICAL WARFARE SERVICE
WAR CREDITS BOARD
INLAND AND COASTWISE WATERWAYS SERVICE

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TAXATION AND INSURANCE DIV.
CUSTOMS DIVISION
BUREAU FOR DEFENSE OF SUITS
CRIMINAL PROCEDURE DIVISION
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ADMIRALTY, FINANCE, FOREIGN
RELATIONS AND INSULAR AFFAIRS DIV.
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FEDERAL PRISON SECTION
PARDON ATTORNEYS SECTION
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FIRST ASSISTANT POSTMASTER GENERAL
DIV. OF POSTMASTERS' APPOINTMENTS
DIV. OF POST OFFICE SERVICE
DIV. OF DEAD LETTERS
SECOND ASSISTANT POSTMASTER GENERAL
RAILWAY MAIL SERVICE
DIV. OF FOREIGN MAIL
DIV. OF RAILWAY ADJUSTMENTS

THIRD ASSISTANT POSTMASTER GENERAL
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DIVISION OF STAMPS
DIVISION OF MONEY ORDERS
DIVISION OF REGISTERED MAIL
DIVISION OF CLASSIFICATION
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NATIONAL ACADEMY OF SCIENCES
NATIONAL GALLERY OF ART
NATIONAL RESEARCH COUNCIL

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FEDERAL TRADE COMMISSION
UNITED STATES TARIFF COMMISSION
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PAN AMERICAN UNION

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JOINT COMMISSION ON RECLASSIFICATION OF SALARIES
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ROCK CREEK PARK & POTOMAC RIVER
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ALIEN PROPERTY CUSTODIAN
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AMERICAN NATIONAL RED CROSS

MISCELLANEOUS

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CIRCUIT COURTS OF APPEALS

UNITED STATES DISTRICT COURTS

VARIOUS SPECIAL COURTS COURT OF CLAIMS COURT OF CUSTOMS APPEALS DIST. OF COL. COURTS TERRITORIAL COURTS

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BUREAU OF ENGINEERING
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WAR MINERALS RELIEF COMMISSION

NATIONAL PARK SERVICE
ALASKAN ENGINEERING COMMISSION
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SUPT. CAPITOL BUILDING AND GROUNDS
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WOMEN'S BUREAU
DIVISION OF CONCILIATION

275
V. 12, No. 12

The Reclamation Record

ISSUED MONTHLY BY THE RECLAMATION SERVICE
DEPARTMENT OF THE INTERIOR, WASHINGTON, D. C.

Better Farming : Better Business : Better Living

THERE CAN BE NO Surer INSURANCE FOR THE NATION THAN TO PUT ITS MEN UPON THE SOIL

VOLUME 12, No. 12

DECEMBER, 1921



NATURE'S ANNUAL MANIFESTATION OF BENEVOLENCE TO THE DESERT.
ON THESE SNOW CLAD SLOPES THE SINGING RIVERS ARE BORN.
WHOSE SUMMER FLOW MAKES FRUITFUL THE RAINLESS VALLEYS OF THE WEST

FUNDS AVAILABLE FOR RECLAMATION.

Condition of the Reclamation Fund—Outlook for New Work.

THE Reclamation Service is constantly urged to undertake new work. In the various arid States there are numerous projects advocated, many of which the Service has investigated. In connection with the present Government projects there are large extensions possible, on some of which surveys and other preliminary work have been carried to the point where construction can begin promptly when financed. In some cases contracts have been made with irrigation districts in contemplation of construction of works badly needed as soon as funds are available.

Under present law the reclamation fund sets a limit on the amount of work that the Reclamation Service can undertake. Hence it is of interest to consider the condition of this special fund in the Treasury, its sources of income, and the outlook for the future.

The question is frequently asked, What is the balance in the reclamation fund? The inquirer is often interested in some new project and wants to know what may be available for its construction. In that sense the answer is usually that there is no balance. In other words, the fund is not allowed to accumulate an idle balance. A working balance is, of course, necessary to meet emergencies and to care for the difference in fluctuation of receipts and expenditures. Except for such a working balance, as fast as the receipts come into the fund they are spent on reclamation work.

This practice of keeping the fund invested is not only in accord with the action of Congress in dedicating it to reclamation work but is now the action in detail of Congress itself. This action is taken in the annual appropriations from the reclamation fund in the sundry civil acts. These appropriations for any fiscal year are ordinarily made some months before the year begins and are preceded by consideration in the Appropriations Committee, which in turn is now preceded by the consideration of the Budget Bureau. As a basis for such consideration appropriation "estimates" or recommendations are submitted by the Secretary of the Interior, assisted by the Reclamation Service. Since the cash in the reclamation fund is kept down to a working balance the estimates and appropriations deal with expected receipts.

Thus it is commonly the fact that the allotment of future reclamation fund accretions to particular projects and work has been made a matter of law or formal plans for nearly two years ahead.

For most of the sources of income to the reclamation fund it is possible thus to look ahead two years and predict receipts with fair accuracy. Recently this accuracy was disturbed by a welcome addition to the sources of such receipts due to the enactment of

the oil-leasing act (act of Feb. 25, 1920, 41 Stat., 450), under which certain percentages of the royalties enter the reclamation fund. Just about the time that the Reclamation Service was compiling appropriation estimates for the current fiscal year an estimate of the receipts from oil leases was attempted by the bureau having it in charge, and the requests for appropriations from the reclamation fund were fixed accordingly. Actual receipts from oil royalties have fallen far below the prediction, and the result is that the current appropriations from the reclamation fund far exceed the receipts thus far entering the fund or now expected. The work planned must be reduced accordingly. Though the appropriations are specific amounts for particular projects they are appropriations of the special fund only, and the appropriation act limits the total expenditure at all times to the capacity of the fund. In other words, the appropriations for the Reclamation Service in the last sundry civil act must be cut to meet receipts, and the Reclamation Service can not do many things contemplated by the appropriation estimates. To reiterate—under present law the reclamation fund receipts limit the work that the Service can do.

Though the oil receipts are of uncertain nature, the element of uncertainty will probably be much less in the future than for this year. Time is supplying a record of actual receipts as a basis for forecast. Also the oil royalties this year were of two classes, and one of these will not continue. This is the royalty for production preceding the enactment. Considerable money in this category was held in escrow, and the reclamation fund received \$3,839,000 in round figures from this source during the past fiscal year. In using the receipts of that year as a basis for forecast this large item drops out. From total receipts there must also be deducted a million dollars that the law requires be transferred from the reclamation fund to the general fund of the Treasury as the annual payment on a loan made in 1910 from the Treasury to the reclamation fund. (Act of June 25, 1910, 36 Stat., 835; act of June 12, 1917, 40 Stat., 149.)

Allowing for these two items, last year's receipts as a basis for forecast are as follows in round figures:

New money:		
Public land and town lot sales	\$2,810,000	
Oil and mineral royalties	790,000	
Less payment on bond loan	1,000,000	
		\$2,600,000
Turnover:		
Construction charges	1,380,000	
Operation and water-rental charges	1,850,000	
Power sales	220,000	
Miscellaneous collections	740,000	
		4,190,000
Total		6,790,000

The foregoing are figures of actual receipts during the year ended June 30, 1921. What of the future? Will present law and conditions continue the receipts about the same? Will Congress supplement the reclamation fund or will it postpone water charges, an important part of the receipts?

Obviously no guaranteed answers can be made to these questions. It is impossible to speak for Congress, but we know that numerous bills have been introduced that bear on different phases of this subject. On the one hand it is proposed to postpone the payment of construction charges by water users on the Government projects as required by present law. Other bills propose to supplement the reclamation fund by new loans from the Treasury. No action has been taken on any of these bills by House or Senate beyond their reference to committee.

Assuming the continuance of present law fixing the schedule of repayments and that the contracts and obligations thereunder will be carried out, perhaps the tabulation above constitutes the best prediction of future reclamation fund receipts. The figures might be modified slightly by the trends in the different items as shown by the records over a series of years or to accord with other known factors. Thus public-land proceeds may be expected gradually to decline with exhaustion of attractive opportunities for homesteads and other entries. Construction charges, on the other hand, are coming due in gradually increasing amount as new lands begin repayments and older ones advance in the schedule set by the reclamation extension act.

Owing to the ills of a deflation period, these repayments recently have been lagging behind the amounts due under the law and, as stated above, there is discussion of proposals to postpone construction charges

and other collections. In favor of postponement it has been contended that owing to price depressions the project farmers have great difficulty in meeting their debt to the United States. On the other hand, some of those interested in new work have contended that preference should be given the debt for irrigation water because this is the foundation of values in the arid region and that any general postponement or substantial reduction of charges is undesirable, because it would virtually stop the extension of the reclamation work to new lands.

In support of the latter statement attention has been called to the limitations of the reclamation fund as given above and to the claims on available funds. A first claim is for the operation and maintenance of completed works, which engages \$2,500,000 or more. This is just about the amount of "new money" indicated above.

In other words, after providing for operation and maintenance there is left for construction work just about whatever is received as construction repayments and other collections or "turnover." Of this, funds are next demanded for urgent construction within completed projects and units, notably the work of drainage necessary to preserve the irrigability of lands in cultivation and the security of the United States for investments already made. During the past fiscal year over \$1,000,000 was spent for drainage work alone.

From the foregoing it seems conservative to say that under present law and prospects for accretions to the reclamation fund a stoppage of repayments would automatically force a stoppage of construction work for the extension of irrigation to new lands, and any curtailment of repayments would affect such works in corresponding amount.

BUTTE COUNTY FAIR, SOUTH DAKOTA.

By F. C. Youngblutt, Irrigation Manager, Belle Fourche Project.

THE Butte County Fair held at Nisland on September 27 to 29 was pronounced one of the best shows held in the Black Hills region. It was the first annual attraction on the new fair grounds and although located near one of the smaller towns of the county, afforded an excellent opportunity for the exhibit of irrigated products.

The fair was predominantly an exhibition of irrigated products. Dry-land crops entered into competition only in corn and cornstalks and these carried off some prizes in the display of the boys' and girls' club. The collections from the project were complete in all the various branches of farming and showed the great possibilities of an oasis in the dry-land region. Here in a few hours' inspection the stranger could acquaint himself with all the things the irri-

gator of this section produces, from bread and butter to pork and apple sauce. It was also an education for the home folks in showing the results of careful farming and better live-stock production. Irrigation under the private Redwater canal also came in for its share of the honors and carried off some ribbons on sugar beets, strawberries, and potatoes.

On entering the grounds the first attraction that greeted the visitor was the women's department, where there was keen competition in sewing, baking, and canning. Here were bread, cakes, honey, jam, and pies "like mother used to make," as well as the many artistic designs traced with the needle. The boys' and girls' club also displayed some excellent work in their various activities, particularly in sewing and baking; their collections of potatoes and

corn all made a creditable showing. The educational exhibits in drawing and penmanship conveyed good impressions of the work done in the public schools. Vale scored in vitalized agriculture, Orman in pen-



One of Mr. J. E. Bowen's fine bulls.

manship, and Belle Fourche on the work of the intermediate grades.

Next in line was the extensive display of agricultural products, consisting of fine community exhibits and individual farm collections of grains, seeds, vegetables, and fruits. Home-grown watermelon tipped the scales at 35 pounds; pumpkin and squash a little larger and better than any raised before; tomatoes, cabbage, and beets all came in for their share of attention and claimed ribbons for quality in their line. The Early Ohio and Bliss Triumph were prominent potato varieties, although many others were displayed. With the price of 2 cents per pound, the German at Nisland summarized the situation this way: "Potatoes 200 bushel per acre—5 acres—make lots o' money." The unique features of the agricultural section were the exhibits of local grown peanuts, tobacco, and sweet potatoes, which showed that by careful culture the project will grow products of more favorable climates. The community collections included some fine specimens of vegetables and other products that were artistically arranged with the names of the centers from which they came. Nisland with its cornstalk wheel was awarded first honors, with Horse Creek, Romans, and Vale close behind in the order named. Chas. M. Reid of the Owl Creek flat had the best display of individual farm exhibits and his collection included samples of all the standard vegetables, grains, and seeds. This, together with his exhibit of live stock, furnishes evidence of the success to be attained in diversified farming.

The poultry department was next. As the crowd looked over the fine showing of chickens, turkeys, and pets the cocks crowed for supremacy and the hens kept right on laying while the show was on. There were Wyandottes, Leghorns, Orpingtons, and a prize

Barred Rock that had previously captured a blue ribbon at the State fair. The exhibit of several kinds of pheasants with their gorgeous plumage made an attractive feature of this department.

Further along the line was the swine and sheep barn with many aristocratic animals. Here the project was well represented with Shropshire, Hampshire, Corredale, and Rambouillet. The Duroc pigs easily predominated, although many settlers raise the Chester White. Berry and Wright, of Vale, exhibited the grand champion boar of 700 pounds at 17 months, as well as several other fine specimens from their herd of registered Durocs. R. D. James, of Nisland, showed a prize pig of 930 pounds and says this Duroc will weigh 1,200 pounds at the next fair.

In the stock barn were found many entries in the Percheron, Shires, and miscellaneous horses. Herefords predominated in the cattle line and most of the prizes in this department were carried off by J. E. Bowen, of Fort Pierre, with his fine line of bulls and helpers that have featured nearly all the fairs in this section. Eli W. Long, of Newell, scored on his Ayrshire stock and says that this is the best general-purpose breed, is of a hardy type, and well adapted to western conditions.

The last barn in the row housed the speed animals that furnished the excitement of the day as they stepped around the track under clouds of dust to win the money and the race.

LIVESTOCK AT THE KLAMATH COUNTY FAIR.

By E. H. Thomas, County Agriculturist.

THE showing of purebred live stock at the Klamath County Fair was a revelation to all. Few people realized that the project now had either the quality or the quantity of high-class breeding stock exhibited.



Mound's Baroness, 2d, junior champion yearling helper, owned by Dale West.

At the county fair two years ago the live-stock exhibit consisted of 1 calf and 2 pigs. Last year

there was a decided improvement. The calf exhibit put on by the boys and girls in their club work made up the best part of the show. This year not only was the boys' and girls' work well represented, but the results of the persistent work of the Farm Bureau in bringing in purebred live stock was shown by an exhibit of more than 225 animals. There were 64 head of registered Shorthorn cattle on the grounds; 36 pens of sheep, representing the Ramboulet, Corriedale, Cotswold, Hampshire, and Shropshire breeds; and 20 pens of hogs, including Poland Chinas, Duroc Jerseys, and Berkshires. The exhibit of dairy stock was comparatively small, but what was lacking in quantity was made up in quality. The string of Holsteins exhibited by the Hawkins Dairy and the Jerseys shown by the R. B. Wilcox farm were worthy of a place in any fair.

Considering that two sales of purebred Shorthorn cattle have been held on the project within the last two years, it was natural that interest in this breed should run high and the exhibit be more extensive than in any of the other breeds at this fair.

A standard classification was used, the entries in most of the classes running from 5 to 15, so that a man winning a blue, red, or white ribbon did so with keen competition.

The senior and grand champion bull award was won by Silas Obenchain on Lord Sultan, a bull purchased at the first Shorthorn sale, March, 1920. Mr. Obenchain also won the senior and grand championship female award, on Seaforth Queen 3d, a cow which topped the 1921 sale.

The junior champion bull award was given to L. A. West on Mountcrest Sultan, a bull purchased last year at the Pacific International sale. The junior champion female award went to Dale West on Mound's Baroness, 2d, the heifer which won him championship honors in the Beef Club division at the Pacific International show.

A. E. Lawson, field representative of the American Shorthorn Breeders' Association, judged the live stock this year. Mr. Lawson complimented the breeders on the general quality of the stock shown.

Within a very short time the farmers on the Klamath project will be able not only to supply good breeding stock needed here, but will be attracting outside attention. There is no reason why this project should not soon become one of the leading purebred live-stock centers.

STRAWBERRY SHORTCAKE IN OCTOBER.

Myron Pickering, Lower Yellowstone Project, Has His.

CRANE, MONT., November 4, 1921.

RECLAMATION RECORD,

Washington, D. C.

GENTLEMEN: I am inclosing a photograph of some everbearing strawberries picked the 26th day of Octo-

ber this year on the Lower Yellowstone project, where our home is located.

Up to this time we have had all the strawberries we cared for on our table, and we had a nice storkcake the 28th day also, at which time we made our last picking.

This will not seem strange to the people who are growing them, but to any one not acquainted with the everbearing strawberry it will appear at least unusual, but I wish to state that it is not unusual, but rather the reverse.



Lucious October strawberries.

We had several frosts and ice froze one-half inch, and still the berries blossomed and ripened, of course, not so fast as in warm weather, but with several square rods of bed we had enough for home use all the time, and in the warm weather we had 60 to 100 quarts a week to sell or give away.

They are very easy to raise if care is taken to eliminate all weeds from the start and keep them pulled out each time the berries are picked. I find they will produce with or without winter covering, but ours are in a sheltered place, where snow usually covers them pretty well from drifting.

I account for the fall bearing by the heavy foliage which covers the low-growing berries and protects them from frost.

We have been quite successful keeping the same bed producing year after year by digging out old plants and training the new ones in proper order, but no doubt much better results would attend the planting of a new bed every second year.

Yours, truly,

Myron Pickering.

When the poultry keeper has a garden the manure obtained by removing the earth floor of the poultry house will compensate for the labor of renewing the floor, and the new earth required can be taken from a convenient spot on his own land.



Greetings to Our Project People.

TO Okanogan, on the North, and Yakima just below, looking out upon the snowy crests of the Cascades; to Klamath amid her forests and lakes; to Umatilla, beside the mighty Columbia; to Orland, project of no regrets; to Newlands, the milk and honey land; Yuma and Salt River, our tropic gardens; Rio Grande, the leader in cooperation; Carlsbad, in the land of turquoise skies; Uncompahgre, blessed by the Gunnison's flow; Grand Valley, where dreams come true; Strawberry, the promised land of the Saints; Flathead, the new land of Opportunity; to Minidoka, where night is dispelled and labors lessened by harnessed lightning; and Boise, gem of Idaho's fertile valleys; to King Hill, the adopted child of the service; to Milk River, Lower Yellowstone, Sun River, and Huntley, Montana's quartette; to Belle Fourche, shadowed by the pines of the Black Hills; to Williston on the Big Muddy; to Shoshone, the Land of Fulfillment; to the North Platte, along the River of Castles; Riverton, soon to blossom; and to Fort Peck and Blackfeet, our Indian projects, we extend felicitations and best wishes for a Merry Christmas.

Winter has clothed many of our projects with its mantle of ermine; the busy days of harvest time are over, and opportunity is now afforded for an inventory of the year's work. This is the season also when the wise farmer will make his plans for the new year.

There are now nearly 34,000 farm families on the Government's irrigated lands, and as a class we believe they measure up with the best in the country. One outstanding quality of theirs is pride in the land of their adoption, and this is making for a splendid citizenship and satisfactory conditions of rural life. On the whole, it is pleasant to journey back in retrospect over the years of their homemaking efforts in the new country. Since deserts and stored waters were wedded they have accomplished wonders. The pioneering years are now passed—years of toil, privation, and struggles that tried men's souls and wearied the spirits of women. Through these years we have followed them in their battle with the desert, prideful to claim a kinship of citizenship, and delighting ever

in their success and achievement. What they have done here has not been for themselves alone. It has been, and will continue to be, an inspiration for other Americans whose longing eyes are hopefully turning toward the land of sunshine, until the silence of now vacant and voiceless valleys of the West has given way to the whirl of industry's wheels and the songs and laughter of happy families. To-day their victory is heralded throughout the land and is stimulating new thoughts in the minds of our statesmen, who are planning for a rural reconstruction in regions where agriculture is slowly dying. The Nation is looking forward to the land as never before in its history. The dignity of the profession of farming is once more recognized, and the world again acknowledges its dependence upon the tiller of the soil. With better appreciation of our reliance upon the man who produces the food of the world, comes a desire to lighten his burdens and more generously reward his labor.

Many of our project families are looking forward to a holiday season with forebodings. This has been a year of great disappointment to them, and the clouds are not yet all dispelled. Some comfort may be extracted from the dark outlook, however, by comparing their condition with that of others. Relatively speaking, their lot is certainly not one whit worse than that of millions of their fellow men who dwell in the cities. If there be any truth in the old adage, "Misery loves company," our farmers have no reason to fear loneliness. At least, they are not going to be hungry; the landlord is not on their necks; and the milk-distributors' union is not murdering their babies. They are not walking the streets out of a "job," or panhandling everybody for a bowl of soup or a night's lodging. Millions of town people are doing just that, you know. There is chaos everywhere in the world, but it is not as bad in good old America as in Europe. Wailing and wringing our hands will get us nowhere. Pulling together, and smiling while we do it, will help a lot. At any rate, this distressing condition can not last much longer. The chap who produces the food the world must eat is in the best position, and will the most quickly get on top. Congress is really getting around to doing something constructive. Big

sums of money for good roads have been appropriated, and that will put a lot of men back to work and back to buying again; it will give confidence to many industries now stagnant. Freight rates are coming down; prices on things the farmer buys are hitting lower levels, and that helps to even up the reduction in values of farm produce. This is a good time right now to begin planning for a new order of business on the farm. One thing every farmer on our projects can do is to make each acre produce more nearly a maximum crop than it ever did before. Get rid of surplus land; sell off the scrub stock; buy a good cow or two; stay at home and clean up the ranch for the spring campaign. Above all else, cultivate cheerfulness, and don't mingle with the grouchy. Help your neighbor when you can. Finally, remember that during the past 70 years the farmer has had to buck up under just as trying conditions half a dozen times as he is to-day, and yet he survived the shock.

The times are propitious and the need is great to initiate a Nation-wide plan to extend our economic foundation in the soil. Such a plan is now receiving the earnest attention of two committees of Congress, and has been indorsed by numerous important organizations of the country. The most attractive feature of the plan, to our notion, is that it gives consideration to a phase of rural life which has been overlooked in other measures of its kind. Heretofore our studies of rural conditions, with a view of stimulating land settlement, have been superficial, and usually from the material aspect. We have stressed too strongly the financial without giving thought to the social and spiritual side of country life. If measures to turn the tide back to the country are formulated solely on the material gains which farming offers they are doomed to failure. Farming throughout the United States is not piling up great wealth for the farmers; too many of them are not much more than making a living. An appeal to our country-minded citizens to go back to the soil must be fortified with something more than farming offers in most parts of the country to-day, or it will catch no one. The farm-trained man or woman who has tasted the joys of the city has no strong yearning to go back to the sort of country life they abandoned. We have first of all to change the country. American agriculture as a whole rests upon a wrong base. While our urban communities in their swift advance have sought to gratify human aspirations for better living conditions, relaxation, social and mental enjoyments, and have made procurable numerous comforts and conveniences, the rural districts have neglected most of these essentials which make life complete. The genius and talent of men have been expressed in a large way in

making available for the urban dweller the things which have given the city its lure; but such talent and genius have found small place in the country. For generations we have spoken of the country as the place to go for health, and to build up our wasted strength. The Nation was shocked to learn, as it did when the war draft exposed the truth, that the country was not healthy; that farmers' sons were inferior physically and mentally to the boys of the town. It was appalling to find that bad teeth, defective eyes, illiteracy, and immorality were more prevalent in rural than in urban communities. Our eyes were opened to truths which, when we consider them, evidence plainly the reason for our decreasing country population.

What is there to be done? Certainly the subject is important enough for our statesmen to give it consideration. If farming offers no great attraction in profits to the farmer, and at the same time imposes conditions of living which are undesirable, then these conditions must be altered materially, or the ever-increasing drift to the city will continue.

It is obvious that no plan of rural reconstruction will succeed which does not embody in it the guarantee of opportunity for the natural desire for social and spiritual gratification. The country must be made more civilized and the life of the farmer more satisfactory and sufficient.

During the recent visit of Secretary Fall to the Shoshone project, an old-timer took the opportunity to poke fun at our little story in the Record detailing an interesting experiment in pasturing pigs on tule marshes. As our report was an interview with one of the most intelligent and progressive farmers on the Rio Grande project, and a graduate of Cornell, we were inclined to be peeved at the criticism of the Shoshone farmer, who, doubtless, had never tried the experiment. We wrote at once to our friend in the Southwest, and also to the Department of Agriculture, and are now prepared to reiterate our statements, that the cat-tail (typha) or "tule," as it is commonly known in the Southwest, as distinguished from the bullrush of Oregon and Washington, possesses real food value for hogs. The experiment of Mr. L. F. Freudenthal, of Las Cruces, New Mex., is again related, because the subject is of interest to hog raisers whose ranches contain tule lands.

Here's the way it began:

Last winter, finding himself short of desirable pasture, Mr. Freudenthal cast about for ways to carry his herd over the spring months. He struck upon the idea of running the pigs on cat-tails, which were abundant in swampy places on his farm. The pigs went wild, figuratively speaking, over this new feed. So a patch of 10 acres was fenced and 60 head of

hogs were given the run of swamp continuously for three months. The only additional feed they received was a small amount of corn every evening to bring them in so they could be counted. At the end of the 90 days the pasture was a body of mud, without a single stalk showing on the surface. All the pigs, young and old stock, were in good flesh, and not once during this time did the animals show any signs of indigestion or other ailments. Although the pigs ate the green flag or stem, the part from which they derived the most nourishment was the roots.

Here's another thing that developed: It seemed after three months' feeding that the cat-tails had been exterminated, so the pigs were transferred to a green pasture. However, within a month the cat-tails had begun a vigorous growth and seemed as plentiful as ever.

Something about the new feed:

The cat-tail is a perennial plant, with large underground root stalks or rhizomes. Several rhizomes originate from a single plant and spread in all directions for distances of from 1 to 3 feet; then suddenly turn and come up and form other stalks. Thus in any cat-tail patch one finds 3 to 4 inches under the surface of the ground a network of these rhizomes. These measure three-fourths to an inch in diameter and are the storage places for the reserve food that has been manufactured by the green leaves.

Prof. Claassen of Cornell University states that the center of the rhizome consists of a core of more solid material, an almost solid mass of starch. This core is from three-eighths to a half inch in diameter. It serves as a supply of reserve food material which enables the cat-tail to send forth new leaves each spring just as soon as the frost is out of the ground. This stored starch induces a remarkably rapid growth. It grows as fast as alfalfa. One acre would yield a total dry weight of 10,792 pounds of rhizomes.

Lyman Carrier, agronomist in the Bureau of Plant Industry of the United States Department of Agriculture, states that he has known hogs to utilize the roots of swamp plants similar to typha (cat-tail) and make fairly satisfactory gains, and sees no reason why such swamps should not be stocked to their full capacity, as it would probably be impossible for the hogs to eradicate the plants entirely.

Muskrats thrive on cat-tail. In fact some Indians use cat-tail as food. J. A. Le'Clerc, of the Plant Chemical Laboratory at Washington, D. C., says that coarse flour, made by running these cat-tail rhizomes through a meat grinder and then sifting through an ordinary fine-mesh sieve, has approximately the same protein as is found in rice and corn flours. The fat content is somewhat lower than found even in wheat flours. He further states that substituting this for as high as 50 per cent in bread and in corn-starch puddings the flavor produced is pleasing and palatable.

This would seem to indicate that no undesirable taints would be produced in the fat of the pig when fed on this cat-tail.

The possible economic importance of this idea becomes evident when one considers that cat-tail grows throughout this country, Europe, and northern Asia. In the United States alone, exclusive of Alaska, there are, according to C. A. Davis, 139,855 square miles of swamp land, of which thousands of acres are cat-tail marshes.

"In feeding cat-tail to pigs it seems to me highly desirable," Mr. Freudenthal said, "that some feed, such as tankage, be added to supply the protein and phosphorus for rapid growth and calcium for strong bones and for normal growth of body tissues."

In the foregoing you have the statement of a reliable businessman-farmer, a graduate in agriculture of Cornell, a man who is a substantial resident of Las Cruces, and one of the most progressive growers in the Mesilla Valley—a man who is dealing with fact, not theory. He worked out the experiment. It was successful. He is arranging to continue cat-tail feeding this winter on a larger scale.

Old-timer's apology is accepted in advance.

Recent investigations of the Agricultural Department in the matter of sheep raising indicate the advisability of intensive farmers feeding a few sheep in connection with their other operations. Sheep will consume much of the wastage about the farm, and cost of feeding will never be more than nominal. The reports of the department on the subject will soon be available on request, and should be read by our reclamation farmers.

NOTED HERE AND THERE.

Salt River project, Arizona.—The following suggestion from Frank Reed Sanders, a breeder of pure-bred cattle, contains much valuable information for our farmers who are becoming interested in dairying:

The Salt River Valley has many advantages for the dairyman, and, while the alluring promise of quick and certain big returns from cotton farming caused a general departure from the dairy business, it is evident now that a farm here should carry some dairy cows, young stock, and hogs, yet many of the farmers who wish to carry out such a program are beset with a difficult problem in securing this stock and thereby saving themselves from the risk of a one-crop system.

The writer would submit a plan for the upbuilding of the dairy industry. This plan could be handled through the various farm bureaus, as they represent the cooperative idea and the general uplift of the rural population.

The plan would call for units of 100, 200, and 500 cows. Groups of farmers in the various farm bureaus could form a subordinate association, electing a president, secretary, treasurer, and directors. Duly organized, they would consider applications of farmers for cows in groups of 5, 10, 20, and 30 head. When applications were filed a thorough examination would be made of applicant's ability to qualify on farm, equipment, help, experience, and character.

Having signed up the required number of cows in units of 100, 200, or 500 head, the organizations would make application to borrow the necessary money for the purchase of the cows. This could be accomplished through a bank or group of bankers, cattle loan company, securities company, or creamery. The security offered the financial institutions would be a series of notes signed by individuals or a joint note by all parties, or both, followed by first mortgage on the stock purchased.

After financing the association, the services of an expert judge of dairy cattle and a member of the association might be engaged to go to the best dairy sections of the country to purchase the required animals.

The writer would suggest selecting the animals in a ratio of 1 registered cow to 9 high-grade cows so that in the 100 unit there would be 10 registered cows and 90 grade cows. For each 20 cows purchased 1 registered bull would be secured whose dam in the Holstein class would have a record of not less than 20 pounds of butter fat in seven days, and in the Jersey, Guernsey, and Ayrshire classes the dam not less than 500 pounds of butter fat on yearly test. To each 100-cow unit add a registered bull whose dam has given not less than 800 pounds of butter fat on yearly test, this last bull being a strictly community bull for service with the registered cows in the association.

Having secured these animals, they could be apporportioned by the expert and two members, division being made as fairly as possible.

The benefits of the plan are as follows:

Probability of successfully financing the purchase; large saving by purchasing cattle in numbers; elimination of speculators and inexperienced buyers; the assurance of expert help in selection; the availability of very high record community bulls; the conservative introduction of registered cows.

The above plan would require that each unit confine itself to one breed of cattle, and with 10 such units formed there would be brought here from 10 to 500 registered cows and 90 to 4,500 high-grade cows and the wonderfully bred bulls as suggested. Following out such a plan, in 10 years the descendants of these purchases could supply very largely the cow population of the Salt River Valley.

Grand Valley project, Colorado.—The Grand Valley Interurban Line is to be extended into the high-line

country for a distance of 1½ miles. Later it is believed that the line will connect at Mack with the Uinta Railway, and perhaps to nearby coal mines. The country crossed by the extension will be a large feeder of the sugar factory at Grand Junction, as soon as transportation facilities are provided. The interurban service in Grand Valley is one of the best in the country, and has been an important factor in developing the district.

On October 15, the total fruit and vegetable shipments from the Western Slope were 6,629 cars, as follows: Peaches, 1,226; pears, 715; apples, 2,035; potatoes, 2,446; onions, 142; lettuce, 60; honey-dew melons, 5. The largest individual payment ever received by a Grand Valley orchardist was paid to J. B. Anderson, of Palisade, who received \$9,500 for his crop of peaches.

Grand Junction, on October 21, was the scene of a most successful auction sale of young Hereford stock, consigned from a couple of breeders at Eagle, Western Slope. The 115 purebred bulls and heifers brought a total of \$18,040, and the sale was attended by buyers from many parts of the Western Slope. It is probable that similar annual sales will be held at Grand Junction.

Boise Project, Idaho.—According to commission men, southern Idaho has been the only district supplying the market recently with head lettuce, which is sold at \$1.50 a crate in the field. The crates contain 3 to 6 dozen heads, according to the size. Since the shipment of head lettuce was started 30 carloads have gone to foreign territory from this district. From data obtained there, the farmers are netting \$500 to \$600 an acre. It is estimated that 50 carloads were shipped from this district this season.

Growing head lettuce in Boise Valley is a new industry, and apparently is a success and will be developed into one of the leading pursuits here within a few years, local men say. Last year but five carloads were sent out of the State. Commission men and farmers said there was such a demand for cabbage also that it was decided to enlarge the planting area.

Belief was expressed that next year this season's crop will be doubled.

One of the busiest places in the valley during the season was the Wilson orchard, where 200 pickers were employed gathering apples, at the rate of from 5,000 to 6,000 crates daily. The total output of this single orchard is estimated at 100 carloads for the year.

Shipping Idaho prunes to California is like shipping "coals to Newcastle," yet that was actually done this season from the Boise Valley. This has been the best year for the prune growers in their

history, more than 481 carloads having left the valley for distant markets.

Minidoka Project, Idaho.—The organization of a rotary club at Rupert on October 27 is noted. This is the second club of this order on the project, the first having been inaugurated at Burley a couple of years ago. Rupert and Burley probably can lay claim to being the youngest towns, and perhaps the smallest, in the United States to be admitted into the general organization. This fact speaks well for the progressive spirit of the citizens, and we are confident both clubs will prosper and render valuable service. The motto of the rotarian is "Service above Self."

Plans are being made to form a live-stock association, similar to others in the country, which have enabled the farmers to secure advances of necessary capital to purchase dairy cows.

Farmers have long realized that more cows are an absolute necessity for this project. They have expressed a willingness to purchase good stock—but the financial situation has been such that this has been impossible.

The war finance corporation has opened the way.

To any reliable association, duly incorporated, money can now be loaned for the purchase of live stock. All that is necessary from the farmer's standpoint is the proper disposition to repay his loan through a certain per cent of the money produced by the cow and a willingness shown to take care of the animals purchased.

The time is here when concerted action is necessary. No time should be lost in taking advantage of the Government's offer.

A live-stock association must first be organized. Stock must be sold. This stock must be subscribed for principally by business men as those purchasing cows can not be members of the association. The notes and security given for stock can be used as collateral to the Government, but will not leave the local banks. For every \$1 security Uncle Sam will loan probably \$7.50 to buy cows. Project farmers who are interested in this subject should write to secretary War Finance Corporation, Treasury Department, Washington, D. C., for circulars Nos. 2 and 3.

A harvest of 1,000 sacks from 3½ acres of potatoes is reported by Henry Neilson, 3 miles east of Acequia. This is an acre yield of 445 bushels. The crop is entirely free from disease, and many potatoes are of unusually large size. Several individual specimens on display weigh from 2½ to 3½ pounds, and a number of others tipping the scales at 5 pounds each have been sent to Oklahoma. Mr. Neilson said he had fully 100 sacks which would run as large as those exhibited. Most of these extra large ones measure approximately a foot in length and from 4 to 6 inches in width.

W. O. Ames, near Rupert, produced 1,800 bushels of Idaho Rurals on 3 acres of ground, and has stored them for the spring market. Nine potatoes grown by L. W. Myers, south of Rupert, had a total weight of 24½ pounds. These were the Mary Murphy variety, a red potato, similar in appearance to the Early Ohio.

Milk River project, Montana.—The A. E. Everett ranch, near Harlem, is probably the busiest place in the community, as Mr. and Mrs. Everett are specializing in chickens and have, among other breeds, 700 thoroughbred White Leghorns, selected for their laying qualities.

They are making the chickens pay their way, in addition are netting a fine profit. Their hens are taken care of in the most scientific way to make them produce eggs in the wintertime, when the ordinary hens are laying off. Mr. Everett made a great many improvements on the place, and intends to make many more, which will give him one of the best equipped ranches in Montana. This summer they raised over 1,500 chicks in their incubators and are making plans to raise more next year, as they will be better equipped.

Lower Yellowstone project, Montana.—The winning of second prize by an exhibit from Richland County at the International Potato Show at Duluth will certainly go a long way toward putting the county on the map as a potato-producing country. Dave Stewart of Crane won second place at the show in competition with all the rest of the United States and Canada on an exhibit of 32 potatoes of the Snowflake variety, a strain of the Green Mountain variety. When one realizes that this was the second-best exhibit of this variety of potatoes submitted by the United States and Canada, it surely speaks highly for the quality of potatoes that can be grown in this section. It is also a very fine recommendation for Mr. Stewart, who has grown this variety of potatoes on his farm near Crane for the past 17 years. They are therefore thoroughly acclimated to this country and are practically free from disease. This winning of the International Show will without doubt stimulate interest in an increased acreage for next year.

Newlands project, Nevada.—Talk about climate! Do you know that on that last day of October the Newlands rancher was still gathering strawberries and picking succulent roasting ears? First thing you know Newlands will begin to advertise her climate in competition to California.

The reopening of the sugar factory at Fallon was duly and fittingly celebrated in the valley. Gov. Boyle and other prominent men gave addresses, and were recipients of the old-fashioned hospitality of our Nevada project people. It was a great day for everyone present.

Rio Grande project, New Mexico.—On the bulletin board at the Santa Fe station in Las Cruces appears

the following introduction to the head of the Success family and its members:

"The father of Success is Work. The mother of Success is Ambition. The oldest son is Common Sense. Some of the other boys are Perseverance, Honesty, Thoroughness, Foresight, Enthusiasm, and Cooperation.

"The oldest daughter is Character.

"Some of the sisters are Cheerfulness, Loyalty, Courtesy, Caution, Economy, Sincerity, and Harmony.

"The baby is Opportunity.

"Get acquainted with 'the old man' and you will be able to get along pretty well with the rest of the family."

Commenting on the foregoing—but is comment necessary at this time?

Thirty-three cantaloupe growers in the valley, shipping through C. H. Weaver & Co., Chicago, received \$20,575.41 net on 55,767 crates, an average of 36.9 cents a crate. The average yield on 234 acres was 238.2 crates, returning \$86.91.

The largest shipper in this deal was I. D. Hale with 58 acres, on which he averaged 285.3 crates an acre. He received a total net return of \$6,788.87.

Mike Bamert raised 5,972 crates on 10 acres, 2 miles northwest of town. He received \$2,881.92, or an average of 48.3 cents a crate. The next highest yield was from B. H. Henry, who harvested 423.9 crates an acre on 4 acres. E. Banegas harvested 419 crates an acre from 8 acres.

Umatilla project, Oregon.—Duroc hogs from the Umatilla ranches of C. P. Adams and C. C. Mason carried off ten blue ribbons at the Oregon State Fair. They also won three of the six State championships for which they competed.

Umatilla's dairy and hog show, held early in October, was a rousing success. The exhibits were numerous and of excellent quality and the attendance large.

Great interest was evinced in the dairy show milk test, which was won by A. W. Agnew's "Chimes," producing 60.5 pounds of milk in two days' milking.

Yakima project, Washington.—The bee-keepers of the Yakima have gathered a crop of 500 tons of honey from their busy workers, and are finding an excellent market for this sweet product. Climatic conditions of the valley are ideal for bee culture, and with the abundance of fruit and flowers here the bees thrive unless they happen to get into the spray districts, when they immediately succumb to its poisonous effects.

Representatives of the Washington Cooperative Egg and Poultry Association express a hope of organizing a branch in Yakima Valley which will sign up at least 50,000 hens. The State Association handled the product of more than half a million hens, according to

Mr. Brown, and in addition to supplying most of the trade in Seattle is sending carloads of eggs to New York. The association also stores eggs for its own members where storage is desired. It buys live poultry from its members, feeds it for the market, and prepares it for sale. Association prices to its members for eggs are 1 cent under the New York price, said Mr. Brown, the 1 cent per dozen going to maintain the branches.

It is believed that a world's canning record has been established on the Yakima by one of the large canneries, which recently put up 60 tons of apples in a single day. Over 35,000 fifty-pound cases of Yakima apples have been canned this season, mostly for export to Scotland, England, and European countries. This market is said to have grown largely out of the war. Our soldiers educated Europe to eat apple pies, and the canned apples from Yakima Valley have won a high place in the estimation of the epicurean pie eaters.

Shoshone project, Wyoming.—J. L. Werts, a prominent ranchman, recently returned to Powell from a trip to Wisconsin, where he hoped to be able to get hold of a carload of dairy cows. He did not buy the cows, however, for the reason that he was unable to make the purchase of the right sort. He found it almost impossible to get hold of first-class animals, but there were many Wisconsin farmers willing to get rid of less desirable cows, which he thought hardly good enough to make it worth while to pay the expensive freight charge of getting them out here. It is the opinion of Mr. Werts that, with freight charges as they are, none but the best cows should be shipped in.

However, as Wisconsin farmers are at present short on feed, Mr. Werts believes that now would be a capital time for Shoshone project farmers to band together and buy high-grade heifer calves from this eastern dairy country. He says they can be bought for \$15 each, and thinks there is a need here for a thousand head of them, if somehow sufficient capital could be raised to buy them.

Is it not possible for the bankers to arrange a loan through the Federal Loan Bank for the purpose?

There is much rejoicing and enthusiasm on the project over the beginning of construction on the electric power line from Shoshone Dam to the valley towns of Powell, Garland, and Deaver. The farmers northwest of Powell are discussing an organization of a rural electric company to purchase and distribute power to the ranches. It is hoped that this will result in the extension of electricity to many farm homes. The promoters can obtain valuable advice and information on the subject by writing to Project Manager Barry Dibble, of the Minidoka project, Burley, Idaho. This project has 20 or more such companies of farmers in successful operation.—C. J. B.

GETTING SETTLERS FOR IDLE LANDS.

A RECENT issue of Organized Farming, the excellent monthly publication of the Dona Ana County Farm Bureau on the Rio Grande project, contains a description of the work being done jointly by the Elephant Butte Irrigation District and the Las Cruces Chamber of Commerce in furnishing information about the county and stimulating immigration to the project.

The lesson contained in this article might well be taken to heart by organizations on a number of our projects where, for one reason or another, areas of land are being held from full development.

One statement particularly in the article is worthy of especial attention, to the effect that the whole value of such work will be completely lost and wasted if the farmers boost their prices at the first indication of a land movement.

The article is as follows:

The publicity and immigration work conducted jointly by the Elephant Butte Irrigation District and the Las Cruces Chamber of Commerce, is getting results which must inevitably be of great benefit to the district, even if such benefit is delayed, for the present, by adverse financial and economic conditions.

Indications are, however, that results will be immediate and substantial, as shown by these facts:

The classified advertising has resulted in 2,235 inquiries in the last 17 days. These have all been answered with bright, snappy personal letters suitable to the questions asked. Enclosed with each letter is a copy of the leaflet "Facts," which in 8 pages briefly yet comprehensively gives the truth about the agricultural conditions of the valley. Each inquiry is followed up with a copy of Organized Farming or some other similar publicity, showing what is being done in the valley.

Copies of the leaflet "Facts" can be obtained by application to the irrigation district, the chamber of commerce, or the Farm Bureau.

A large number of direct replies have been received to the effect that the writers would visit the district at various times during the winter. Already there have been several prospects actually on the ground in response to this work.

Most of the inquiries come from the North Central States, with the Southern States a close second. Some have been received from as far as New York, Maryland, Montana, Oregon, Washington, and California.

The advertising is being conducted in the name of the Farm Bureau, because it is known throughout the United States as an organization devoted to unselfish public service, high ideals, and cooperative self-help.

The office since June has an actual clipping record of more than 45,000 inches of news items concerning the district and Las Cruces. It is estimated that this does not represent more than 30 per cent of the news items actually put across, because it is impossible to obtain clippings from all the newspapers and magazines.

This publicity could not be purchased at any price, but at current newspaper rates the value would be far in excess of \$150,000.

The work is financed under a cooperative contract, whereby the Elephant Butte Irrigation District contributes \$250 a month and the chamber of commerce

\$500 a month, or a total of \$650 a month. Some of this is being anticipated from the summer months and will be used for an extensive campaign this fall and winter.

None of the organizations cooperating is making any direct effort to sell land. Their function is solely to secure the immigration and furnish truthful, unexaggerated information about the country. The policy adopted is "The Truth is Good Enough." There is a printed line on the bottom of every letter sent out: "The Farm Bureau Consists Solely of Farmers and Has No Land for Sale." At the top is the motto: "An Organization to Make the Home Farmer Prosperous."

Many of the mail inquiries and visitors ask what they can secure in the way of their special desires.

Therefore, the irrigation district and chamber of commerce will make up a loose-leaf book filled with suitable printed blanks for filling in with the principal details about any farm listed. Reference can be made to this book of listings whenever there is an inquiry for land.

The whole value of this publicity and immigration work will be completely lost and wasted if the farmers boost their prices at the first indication of a land movement. Therefore, it is important and necessary that the owner consider well the price he quotes and be absolutely sure he is willing to sell at that figure. It is well to remember also that land is a competitive commodity and can not be sold above current prices here or elsewhere.

Form used for listing lands.

Location of farm (give way to reach farm by auto, not legal description).....

Total number of acres; acres alkali-
ed or seeped; acres cultivated.....
acres bosque; acres not cultivated
.....; acres in river

Describe improvements: (Give estimated values)

Character of soil (light, heavy, black, silt, adobe, sandy):

What crops are grown?

Irrigation and drainage: Which ditch?.....

Distance to main ditch; how much land
is properly leveled?; condition of farm
ditches how far from drain canal?

Depth to ground water

Condition of title: Have you an abstract?.....
give details: Describe advan-
tages or disadvantages of this farm:

I guarantee to the Elephant Butte Irrigation Dis-
trict for the period of six (6) months from date the
price of \$..... an acre or the total of
\$..... for this farm.

Terms

Signed

Owner or agent.

Date

Address

THE FLATHEAD PROJECT.

One of Montana's Most Beautiful Valleys.

C. J. Blanchard, Statistician, U. S. R. S.

RECENTLY we asked Gov. Dixon, of Montana, what he thought of the Flathead project, and here, in part, is his answer.

My own judgment has always been that the productive Flathead Valley would ultimately rival the Yakima. I may be a little partial in this matter, for the reason that my own ranch home is situated at the upper end of the valley on Flathead Lake. Personally, I know of no more productive soil, or any with greater possibilities, in the Northwest. The United States reclamation project, which covers a good part of the dry lands, is now nearing completion.

It is my own belief that the day of the large farm unit, with pay-roll help, is a thing of the past. The irrigated farm of the future will be that unit which can economically be handled by the owner and his family. Certainly no place in the Northwest offers better opportunities than does the Flathead for the making of substantial and prosperous homes.

Gov. Dixon's faith is evidenced not merely in words, but an investment in one of the most up-to-date ranches in the West.

The history of the Flathead project is not a pleasing one from the standpoint of the settlers who came early upon the scene. They have experienced many trials and tribulations by reason of the delays of Congress in appropriating the necessary funds to complete the irrigation works. Since the opening to homestead settlement of large areas of former Indian lands in 1910, many of the settlers have closed out and left the valley. The number of large landowners there to-day is great, and now that the irrigation works are nearing completion they are confronted with the problem of finding practical farmers to take over the excess lands. At the same time, numerous tracts of deeded Indian lands have come on the market, so that the abundance of available land has kept the prices low. Then, conditions, of course, are greatly to the advantage of home seekers. In our recent visit to the valley we were impressed with the fact that, considering climate, soil, and variety of crops, the prices were far below those of other sections not so favored.

The Flathead Valley stands out prominently among a number of the attractive mountain valleys of the West. In point of scenic charm and beauty it has no superior. Climatically, it should attract settlers from the great agricultural States of Iowa, Minnesota, Kansas, Nebraska, and Oklahoma, because of its mild winters, freedom from severe storms, and its pleasant summers. It is a far more livable country than one would expect to find in such northern latitude. Partly this is due to the influence of the Japanese current, which brings the soft wind in winter, known as the "chinook"; and partly also to the modifying effect

of the great body of water, Flathead Lake, which never freezes. The valley possesses little to remind one of the desert. It is hemmed in on all sides by lofty mountain ranges—the Mission Range of the Rockies being one of the most strikingly beautiful in the West. The mountains are clothed in splendid forests of pine and cedar, furnishing abundant fuel and lumber, and good grazing in summer for cattle and sheep. From these mountains innumerable streams come tumbling down to the valley, which is grass-covered, and not sagebrush. The soils of the valley, while somewhat varied, are generally quite fertile, and some are exceptionally rich. Under irrigation these soils produce a great variety of crops, including apples and cherries, small fruits, potatoes, sugar beets, cereals, alfalfa and other clovers. Conditions here are ideal for dairying. Abundance of cool fresh water, succulent forage and pasture, silo crops and mild winters, constitute a combination of favoring conditions which should attract dairymen from States like Wisconsin and Iowa particularly.



Our new land of opportunity.

The large industrial cities, like Butte and Anaconda, and the numerous near-by mining camps, furnish a fine market for the products of the dairy farm. Montana as a whole produces but a small part of the butter and cheese consumed within her borders.

Here is a virgin field for the practical farmer, the fruit grower, and the stockman. The present prevailing low price of land should prove attractive. An investment now in a good ranch on the Flathead would be wise, because these lands are certain to be in demand as this region becomes better known. Our

desire is to make our project people acquainted with the Flathead country. There is constant movement of our farmers, by reason of sales. To those who have reaped generous rewards on other projects by bringing their lands up to high valuation and are selling, we strongly recommend a visit to the Flathead country. Of course, they are going to locate under a Government irrigation system when next they buy! Well, here's a good one! Water ready; land easy to subdue; and a fine community already established. You'll find a hospitable welcome, and real bargains everywhere. Here are farms just suitable for your boys who are striking out for themselves. You can give them a start without exhausting your bank account, and with the assurance that they can "make good." Why not take a trip to the Flathead this winter and look it over? Signs are not lacking that we are on the eve of a great movement to the land. Cheap, irrigated lands are hard to find, as everybody knows. We know of none comparable with that of the Flathead, which can be obtained at the prices obtaining there to-day. This invitation is not extended to speculators. They are not wanted on the Flathead; but real, honest-to-goodness, practical farmers, who are not afraid to work, are very much desired. When you go there, see the project manager at St. Ignatius, and get your information straight.

State Commissioner of Agriculture Chester C. Davis comments on the Flathead projects as follows:

"Farming is not an occupation, but a mode of living," once remarked a noted man. The magnificent opportunity the Flathead Valley offers for the pleasantest kind of living has recalled to mind the epigram every time I have visited the Flathead project. Development has proceeded just far enough to demonstrate the agricultural possibilities and to enable one to visualize the real home-making opportunities of the district.

A farmer looking merely for a region where he can grow forage crops and cereals and raise live stock and produce pork will find many districts besides the Flathead that will fill the bill; but the home seeker who desires in addition to these beautiful surroundings an equable and invigorating climate, good water, and the opportunity to make a real home, will look far before he finds a district that is the peer of the Flathead.

It is, furthermore, a district of possibilities. The immense hydroelectric potentialities at the mouth of Flathead Lake will be developed and utilized at no distant future; and there is every reason for believing that industrial developments will supplement the agricultural.

The Flathead has drawbacks, but only time is needed to efface them. They are the drawbacks that are found in all newly settled districts. Some settlers there have failed, and moved away. Lack of working capital, inexperience in farming, and inability to learn; painting of primrose pictures, without the stick-to-itiveness to realize upon them—those are the primary reasons for such tenantless houses and un-

titled fields as the passer-by may see. This is the negative side of every land-colonization movement.

The obverse is to be seen in the successful farms and the pleasant farmsteads that dot the project in increasing number each year. Each district has problems of its own that can be solved only through experience. Men of grit and women of pluck pave the way for the future, and the others depart. So it has been in the Flathead.

In my opinion there has been too much grain farming, too little diversified farming, and too much trust in rainfall upon the Flathead project. The most successful farmers there are those who are reducing their acreage of grain, expanding their acreage of alfalfa and clover, and stocking up with dairy cattle and hogs. These successful farmers use the water that the Government canals provide—not at the last minute, when their crops have begun to burn—but long before.

Dairying, hog raising, and potato culture, and the production of berries and small fruits; to my mind, these are the possibilities of the Flathead that will eventually reduce the size of the farmsteads to 40 and 80 acres. Canning factories and sugar-beet factories will logically follow.

It is a beautiful pine-clad, well-watered region, of an average elevation of 3,000 feet. It is just rolling enough to be interesting; and the climate is balmy enough to insure verdure on the unfenced lands in even the dog days of August. It is an arid region, so far as certainty of crop production without irrigation is concerned, but the bleak loneliness commonly connoted by the word "aridity" is wholly lacking.

A branch of the Northern Pacific Railroad cuts through the project and gives ready access to market. The western Glacier, Yellowstone Park, Federal-aid highway, likewise pierces it from end to end. There is big game hunting in the near-by mountains, and trout fishing in the numerous streams.

Rising a sheer 7,000 feet from the floor of this oasis, is the Mission Range of mountains, its crenelated skyline bathed in eternal snow. Silent, imperturbable, it stands guard over the valley, and broods on the wondrous future that its waters have made possible.



Home of E. E. Frey, west of Powell, Shoshone project.



DECEMBER SUGGESTIONS FOR POULTRY FARMERS.

By H. O. Numbers, Poultry Expert, Loretto, Pa.

OUR aim this month is to receive a 50 per cent yield of eggs, and in order to do this, we must develop the May and June hatched pullets by artificial methods.

The old-time poultrymen consider 20 per cent production in December about normal; that is, 20 eggs daily from 100 hens. Those old-fashioned theories and rules can not be applied to-day, when feed costs are up and labor and other materials are almost prohibitive. We must speed up production.

The theory held by many poultry farmers, "that it does injury to the birds to use artificial methods to accelerate egg production" can easily be disproved, when we demonstrate after numerous tests that birds developed artificially have proven better layers throughout the year, sustained better health, and made the best kind of breeders.

Last year in order to secure early winter eggs and a continued production, we installed an artificial lighting system, using electricity. At the time of installation we were receiving the "20 per cent production." The pullets we used were hatched in June and July. Lights were applied in January. Our records show a 20 per cent increase in 10 days; at the end of 20 days we received a 50 per cent yield, and in fact after one month it became necessary to reduce the working time of our birds, lest they do injury to themselves in laying too much. Those same birds ran scores over 60 per cent during the spring and summer, and on November 10 we still received 10 per cent from these pens. Furthermore, we mated these birds during the breeding season, pullet matings, with the result that we obtained a higher percentage of fertility, better hatches, and bigger, stronger, and sturdier chicks, which matured one month earlier, than from our regular breeding pens without lights. Through the entire season we did not have one sick bird, and in physical condition they surpassed the birds not under lights.

For the benefit of the Record readers and to further prove our tests, we turned the lights on two

pens October 19, 1921. The birds, White Leghorns, were hatched in April and May.

Following is a schedule of results:

Number of eggs (50 pullets).

Date.	First 10 days.		Date.	Second 10 days.	
	Pen 1.	Pen 2.		Pen 1.	Pen 2.
	<i>Eggs.</i>	<i>Eggs.</i>		<i>Eggs.</i>	<i>Eggs.</i>
Oct. 19.....	19	19	Oct. 29.....	21	26
20.....	14	10	30.....	27	22
21.....	16	14	31.....	27	21
22.....	17	15	Nov. 1.....	22	25
23.....	15	15	2.....	23	26
24.....	16	17	3.....	23	21
25.....	21	18	4.....	31	29
26.....	17	16	5.....	27	28
27.....	19	17	6.....	24	22
28.....	22	19	7.....	27	25
Total...	176	160	Total...	252	245

The lights were turned on at 4.30 a. m., giving the birds a 13-hour working day. We find 13 to 14 hours give the best results.

You will understand that when you put lights on your birds all other conditions must be in proportion. That is, if your birds are to work 5 to 6 hours longer each day, they must eat more food accordingly. Our birds consume 4 pounds of grain daily in excess per pen of 50.

Our feeding schedule follows:

7 a. m. Green feed—beets, cabbage, or oats sprouts.

10 a. m. Buttermilk or green-cut bone.

3 p. m. Green feed and a feeding of grain; 4 ounces per bird in deep litter. The birds will eat only about half, hence the other half will remain for their breakfast next morning at 4.30 a. m.

Mash hoppers are constantly open.

After dark we place a supply of greens in the feeding racks, to be ready for next morning.

Fresh water, grit, and shell are always available. Our lights are turned on by a simple device of our own, using an alarm clock and in connection a trap-

like arrangement to throw in the switch. We will gladly give details upon request. We use 50 candle-power globes (milk white) with deflectors on the ceiling, installing one globe for every 150 square feet of floor space. There must be no dark corners; our pens are light as day. It costs us one-half cent per hour for each light. Our pens are so constructed that two lights are required, hence the daily cost for electricity is 3 cents per 3 hours. We sold our pullet eggs at 85 cents per dozen.

Our reason for dividing the tests in 10-day periods is that the first 10 days bring the birds to a normal condition and the second 10 days form a reliable basis to work upon; the birds will continue if properly and regularly handled.

We gather most of our eggs by noon, after which the fowls use their time in working for the next day's output. At 5 a. m. our poultry houses are a veritable music box; the birds seem happiness personified. They seem to dread when the evening approaches with its darkness and gloom, and only go to roost in anxious anticipation of the morning light.

We submit the following analytical table of results:

<i>Pen 1.</i>		Eggs.
First 10-day period, laid-----		176
Second 10-day period, laid-----		252
Increase-----		76
At 85 cents per dozen-----	\$5.38	
Cost of electricity, 10 days-----	0.30	
Excess feed, 40 pounds at 3½ cents-----	1.40	
Total excess cost-----	1.70	
Net gain on pen 1 for 10 days-----	3.68	
<i>Pen 2.</i>		Eggs.
First 10-day period, laid-----		160
Second 10-day period, laid-----		245
Increase-----		85
At 85 cents per dozen-----	\$6.02	
Cost of electricity, 10 days-----	0.30	
Excess feed, 40 pounds at 3½ cents-----	1.40	
Total excess cost-----	1.70	
Net gain on pen 2 for 10 days-----	4.32	

We do not believe results will be so successful if any other lighting system is used. Electricity is convenient, clean, and economical.

The morning is the time to use your lights. We know some who add the light at the end of the day. Besides being unnatural to the fowls, it works a hardship on the poultryman, as he must either use dimmers to get his birds to roost or have a lot of birds lost on the floor when his lights are turned off.

Our system has proven very satisfactory, and we feel that we could not improve.

Let no man tell you it can't be done. It can be done. It has been done. It is now in use successfully.

In the November issue of the RECORD we mentioned a "break out" of *roup* among our pullets. By a typographical error this was printed "croup." Please note and correct in your copies of the RECORD.

Timely Advice from Agricultural Expert.

Mr. C. S. Scofield, of the Bureau of Plant Industry, United States Department of Agriculture, recently made a trip over the Sun River and Milk River projects, Montana. As a result of his observations Mr. Scofield makes the following pertinent suggestions concerning the agricultural development of these projects:

The production of the small grains except for farm needs is not profitable.

On the lighter soils potatoes yield well and should be an important crop.

Sugar beets should be one of the most important cash crops where a sugar factory is within reach.

Neither potatoes nor sugar beets can be produced continuously or profitably except in rotation with alfalfa and with the use of farm manure.

The production of alfalfa hay for shipment to distant markets is not economically feasible except in occasional seasons when prices are abnormally high.

A profitable agriculture on these projects must be based primarily on live stock with potatoes or beets or both as the chief money crops.

The chief live-stock industries should be dairying and hog production with possibly some beef and sheep feeding.

In the earlier years of development the chief dependence for farm revenue should be live-stock products, butter fat, and pork.

Dairying and pork production require chiefly irrigated pastures, alfalfa hay, some grain such as oats and barley, and either silage or root crops such as sugar beets or mangels. It requires about 3 acres of good irrigated land to produce the feed necessary to support one good cow for a year. A good cow under such conditions ought to produce about 300 pounds of butter fat, one calf worth at least \$10, and 5 tons of skimmed milk worth at least \$5 per ton as hog feed.

In connection with dairying, hog production should be a safe and profitable industry on these irrigated lands. It may not be practicable to produce fat hogs on these projects because of the low yields of corn. But with a continuing supply of skim milk, alfalfa pasture in the summer, alfalfa hay, and root crops for winter feeding, and a supplemental supply of barley or oats, it is possible to produce cheaply two crops a year of light hogs that find a very ready market in the corn belt South and East as feeders.

With such a system of live-stock farming, above outlined, it is easily possible to incorporate as much potato and sugar beet production as economic or market conditions justify. In any event the system outlined does not require a large capital investment if undertaken gradually. It does not of necessity involve community cooperation, which is sometimes hard to

obtain in a new region though such cooperation tends to promote efficiency where it is possible to have it.

Limits on Registration of Farm Name as Trade-Mark.

Many farmers throughout the country are finding it to their advantage commercially to give their farms attractive names that can be used in connection with marketing their products. Provided the quality of the product is kept up, a reputation is quickly established for the farm and the commodity that makes the name of real worth in dollars and cents when it comes in competition on the market with other products. The name becomes in time a real asset to the owner and has a money value much like the good will in other kinds of business.

In England many farms have borne distinctive names for years, which have become famous in connection with various products. This has been especially true in the case of certain breeders of cattle. The name of the farm passes current among cattle breeders as a sort of guarantee that animals from that farm are all that is claimed for them. The practice is coming into vogue in this country, and with it a desire to be protected against others adopting the same name and thereby benefiting by the reputation already established for it.

The United States Government, through its Patent Office, which interprets the trade-mark and label copyright laws, is prepared to give this protection within certain limits. Some of the States have laws authorizing the registration of farm names with the State authorities and no one else in that State is allowed to use the name. This is merely for use within that particular State. The United States Patent Office, however, is prepared to register farm names as trade-marks if they meet specified requirements. This will protect the owner against their use by others anywhere in the United States. There are certain requirements, however, that must be met as in the case of other sorts of names used as trade-marks under the Federal trade-mark law. The farm name, for one thing, must be used by the farmer as a trade-mark on his products that he ships to points outside his own State; in other words, a commodity that moves in interstate commerce. It must be printed, stamped, or otherwise attached to each parcel. The Federal law makes no provision for the registering of names used as trade-marks on commodities that are shipped only within the State.

Although it is thought advisable, it is not necessary that the name be arranged into any distinctive design. Under the trade-mark act of 1905, it was not possible to register a name that is merely geographical, or merely descriptive, or is merely a surname not displayed in some particular or distinctive manner. Such marks, however, can be registered under the act of

1920, if they have been in use by the applicant in interstate commerce for not less than one year. In this way Congress sought to give recognition to a common-law right in a name used as a trade-mark on the ground of its use.

Officials of the Patent Office point out that the names of varieties of seeds or plants can not be trade-marked. For instance, a seed grower may develop a variety of watermelon, which he chooses to call the "Excelsior," and to sell the seed as such. Even though the seed goes into interstate commerce, its name can not be registered, and any buyer who reproduces that variety of seed can sell it under the same name. "Excelsior" is the name of the variety, it is pointed out, and no matter who produces it the seed is still of that kind, and can be offered for sale as such by anyone producing it. This also applies to strains and breeds of live stock.

Sunflowers for Feed in the Southwest.

In Bulletin No. 126, just issued by the experiment station at the New Mexico College of Agriculture and Mechanic Arts, at Las Cruces, Prof. George R. Quisenberry, agronomist; Prof. O. C. Cunningham, dairyman; and Prof. Luther Foster, animal husbandman, give the results of a series of experiments, extending over three years, with Kansas-grown Giant Russian sunflower of 100 per cent germination and purity, in soils varying from sandy loam to sticky gumbo, planted at various elevations and under conditions of varied rainfall. Their summary follows:

Sunflowers make a more rapid growth when seeded after cool weather in the spring than if planted earlier.

Early plantings do not produce as heavy a tonnage or as succulent plants as the later seedings.

Owing to their dense growth the plants are not bothered by weeds after they attain a height of three feet or more.

An easily worked fertile loam produces the heaviest tonnage.

Close planting produces a heavier tonnage of finer silage than widely spaced plants.

The plants will not survive, especially on heavy soil, if water is allowed to stand around them for any length of time.

Cattle, sheep, and goats eat the plants, when fed either as a soilage crop or as silage.

Cut plants heat readily when piled; therefore, they should be sliced immediately after removing from the field.

The silage does not taint milk.

For milk and beef production, sorghum and sunflower silage have about the same feeding value.

Sunflowers do well at any altitude in New Mexico under irrigation and dry-farming.

On account of their quick growth, Russian sunflowers serve as an excellent emergency silage crop.

The college experts say that sunflowers should be planted as soon as the soil warms up in the spring; under ordinary conditions they may be planted about ten days earlier than corn.

Although sunflowers do well with little preparation of the seedbed, better results may be expected from a thorough preparation. The soil should be plowed

early and worked thoroughly with a disk and harrow. Under irrigation, better results were obtained by breaking the land thoroughly, irrigating it, then rebreaking before seeding.

Five pounds of seed to the acre will make a satisfactory stand, but under ordinary conditions from 8 to 9 pounds should be drilled in 42-inch rows.

Cultivation should be started early, as soon as the plants attain sufficient height so that the rows may be readily followed. It is seldom possible to give more than two cultivations with a straddle row cultivator.

Where irrigation is followed, water should be applied to the land as soon as the plant shows signs of wilting.

Sunflowers may be cut for soiling purposes with a corn knife when they reach a height of 4 or 5 feet, and the cutting continued until the seeds are well formed. Stock eat the tender sunflowers as well when fed whole as they do when the feed is cut up, seldom leaving even the coarser stalks unless they are far advanced. Cattle, sheep, and goats ate the sunflowers in the pasture even though there were several other pasturage feeds available; the cattle eating them in preference to green oats; the sheep and goats preferred them to weeds.

Harvesting may be done with either a row binder or by hand with a corn knife; in the standard rows the cost in each case is about the same. When the sunflowers are cut they should be hauled immediately to the silo and cut, as evaporation is very great from their succulent foliage and stalks, and if piled they begin to heat within a few hours. Cut sunflowers pack more solidly than other crops, and, as a rule, about one-third more can be put in an equal space. It is not necessary to add so much water to them as would be added to other silage crops.

Harvesting should start when the plants are about 25 per cent in bloom. At this stage most of the lower leaves are still attached and the maximum weight will be secured.

Methods of Preparing Pork Products on the Farm.

Every farmer can well produce the pork and pork products which are consumed on his farm, for selling hogs and buying pork involves profits, but not to the farmer engaged in the practice. Farmers' Bulletin 1186, published by the United States Department of Agriculture, tells how hogs should be killed, and describes different methods of curing and canning pork on the farm. Highly nutritious and palatable pork products for home use are easily made. Pork can be cured and canned in a number of ways, and the variety of products affords a supplement to the daily meals.

A hog of medium condition, gaining rapidly in weight, yields the best quality of meat. A reasonable amount of fat gives juiciness and flavor to the meat, but large amounts of fat are objectionable. Smooth, even, and deeply fleshed hogs yield nicely marbled meats. The meat of old hogs will be improved if they are properly fattened before slaughter, but young hogs from 8 to 12 months old are best for furnishing the home meat supply.

The bulletin emphasizes especially the importance of selecting only healthy hogs for slaughter and of thoroughly cooking all pork products used for food.

Even if the hog has been properly fed, and carries a prime finish, the best quality of meat can not be obtained if the animal is not healthy. There is always some danger that diseases may be transmitted to the person who eats the meat, particularly if it is not thoroughly cooked.

Hogs intended for slaughter should not be kept on full feed up to the time of killing. It is better to hold them entirely without feed for 18 to 24 hours prior to that time, but they should have all the fresh drinking water they want. It is essential to have the proper equipment for rapid and skillful work at killing time. Such equipment includes a straight sticking knife, a cutting knife, a 14-inch steel to keep the knives sharp, a hog hook for holding the animals, a bell-shaped stick scraper, a gambrel for holding the hog to facilitate cleaning and cutting the meat, and a meat saw. If the hog is not too large, a barrel is a convenient receptacle for scalding.

Complete directions for killing and cleaning a hog, properly cutting the portions of meat, rendering lard, making sausage, smoking cured meat, and home canning of pork and pork products are described in the bulletin, copies of which can be obtained free on application to the Department of Agriculture.

Opportunities in Growing Feeder Pigs.

In the last few years feeder pigs have become a factor on a number of the central markets. Certain sections where finishing feeds are not plentiful or dependable now regularly sell pigs of this class, and corn-belt farmers have come to depend upon them when corn is plentiful or pigs are scarce at home. As this phase of pork production promises to become more important, and as certain areas seem particularly adapted to the growing of feeder pigs, the United States Department of Agriculture plans to study both their production and their finishing.

It is probable that the pigs will be grown at Government farms at Huntley, Mont., and Yuma, Ariz. Pigs, at least those produced on the Montana farm, will be shipped into the corn belt to be finished, and a comparison of methods from farrowing to marketing will be possible.

Before the war many hogs were finished in the Northwest on barley and wheat, but during the war the need for bread grains made this practice inadvisable and hog production fell off and has not come back to normal. Fifty per cent of the live hogs now received on the Portland market are shipped from Nebraska. Feeder pigs are also sent to the coast in some instances, 30 carloads having been recently shipped to a California garbage-feeding firm from Kansas City. The demands of such feeders and of orchardists and vineyardists, who are learning the value of animal manure for their crops, should provide an outlet for many thin pigs that might be produced in the Southwest. This part of the country could hardly expect to ship feeders into the corn belt.

Department men who are studying the problem say that in the Northwest it is planned to have the pigs farrowed in March or April so that they can be grown out on alfalfa and supplemental feeds (which are necessary for the most profitable rate of growth) and be ready for farmers in the western part of the corn belt in October and November, when they should weigh about 100 pounds. Good feeders generally bring a little more than the market price for finished hogs. It is thought that most of the feeders produced in this area will be distributed through the central markets or through the help of county agents. Later, as hog raising develops, it is anticipated that many more will be finished in the locality where grown, particularly in years of good corn and small grain crops.

New Method to Control Worms in Pigs.

What makes the difference between thrifty pigs and unthrifty ones? Naturally, there are many causes, including breeding, feeding and shelter, but a principal one and one that may easily be overcome is worms—the common intestinal round worms. These parasites are often largely responsible for the high death rate among young pigs, and many cases of so-called thumps are the result of worm infection.

A new and effective method of worm eradication has been devised by the United States Department of Agriculture. First, it is necessary to clean the farrowing pens with hot water and lye. Then wash the dirt from the skins of the sows before farrowing and put them in the clean pens. Within two weeks after farrowing remove the sows and pigs to a clean pasture, and keep the young pigs on clean pasture for at least four months. In order to produce strong, healthy, profitable pigs it is of course necessary that they have good feed, water, and shelter in addition to worm-free surroundings.

Good Bulls Raise Butterfat Average.

According to tabulations made by the Dairy Division, United States Department of Agriculture, the use of 41 purebred bulls on purebred cows resulted in an average improvement in the annual production of the daughters as compared with their dams of 50 pounds of butterfat each. This forcibly suggests the improvement that is likely to come in an ordinary herd from the use of meritorious bulls.

There is no best breed of light horses. Some breeds are superior to others in certain respects and one breed may be better adapted than another to certain local conditions. The general requirements for a particular section and the popularity of a certain breed in a certain locality should receive the utmost consideration in choosing a breed.

The Reclamation Record.

Issued monthly by the Reclamation Service, Department of the Interior, under the authority of the Secretary of the Interior.

Copies of the RECLAMATION RECORD will be sent without direct charge to any water user on our reclamation projects. The subscription price to others is 75 cents a year, payable in advance. Subscriptions may be forwarded to the chief clerk, United States Reclamation Service, Washington, D. C., and remittances (postal money order or New York draft) should be made payable to the special fiscal agent, United States Reclamation Service. Postage stamps will not be accepted.

Material for publication in the RECLAMATION RECORD should be addressed to *Editor*, United States Reclamation Service, Washington, D. C., and should be mailed in time to reach the editor not later than the 14th of the month in order to insure publication in the succeeding month's issue of the RECORD.

HUGH A. BROWN, EDITOR.

SUBSCRIPTION BLANK.

Reclamation Record.

[To be used only by persons who are NOT water users on the projects of the U. S. Reclamation Service.]

_____, 1921.

CHIEF CLERK,

U. S. Reclamation Service,

Washington, D. C.

DEAR SIR: I am NOT a water user on one of the projects of the U. S. Reclamation Service, but wish to receive the RECLAMATION RECORD each month.

I inclose herewith 75 cents for a year's subscription beginning with the current issue.

(Name.)

(Street and number.)

(City and State.)

(Write plainly.)

NOTE.—Send money order or New York draft, made payable to Special Fiscal Agent, United States Reclamation Service. Do NOT send stamps.



Essays on Americanization.

A PATRIOTIC citizen of Powell, Shoshone project, Wyoming, has made an offer to the local public schools of prizes aggregating \$30 for the best essays on the subject of "Americanization." One series of prizes will be for the high-school pupils, the other for the grades. The first prizes will be \$7.50 each, the second prizes \$5, and the third \$2.50. The essay for the older pupils must be 200 words in length, and in the grades 150 words.

This is a fine practical suggestion which other communities will do well to consider. Unless we inject a little patriotism into our schools another generation will see us back where we were before the war, when our immigrants could go on till doomsday for all we cared, praying in their hearts, "God save the King," when our National Anthem or the passing of the Stars and Stripes elicited absolutely no notice, no mark of respect from the great American public. It is most important and fitting that American born or American acquired children should be taught to regard the flag as something more than a gaily colored rag to be carried at the head of a procession.

That woman isn't fit to be a mother who doesn't see to it that not only her own child but the children of the community are schooled in practical patriotism and reverence for our flag.

Raspberries in October.

It's your own fault if you don't have fresh berries not only for a few weeks in the spring, but until the frost comes. Dr. Groom, near Rupert, Minidoka project, Idaho, recently was exhibiting a branch from a raspberry bush that would make California green with envy. The berries, resembling dewberries in color and size, were bunched like grapes on the small branch. The Doctor has several rows of this variety of everbearers which he set out last spring, and he intends to go into the business more extensively next year. From one-fifth of an acre of ground Dr. Groom this year marketed \$300 worth of raspberries, showing that small fruit is a paying proposition in Idaho.

THE YAKIMA PROJECT GROWS THEM, TOO.

Mrs. Jean K. Gawler, who with her husband has been connected with the reclamation work since its in-

ception, writes that they have just transplanted their strawberries, from which they are still enjoying luscious berries, the everbearing variety.

Their city lot is 50 by 140 feet; the house and lawn consume 80 or 90 feet of it, and the garage also comes out of this space. During the past season they took 350 pounds of apricots from one tree of the Morepark variety, which bears very large fruit. They sold these for 3 cents per pound. From 5 peach trees they had between 90 and 100 boxes of fruit, 60 boxes of which they sold to fruit men at 70 cents a box; the rest were sold loose or used by the family and friends. From two small pear trees they picked 5 large apple boxes full, for which they got 4 cents a pound. There were 3 varieties of grapes from a 20-foot arbor, cherries for family use, and 18 kinds of vegetables, which supplied enough canned food for the entire year. Mrs. Gawler cleared over \$50 from her little strip of back yard, besides having a plentiful supply for her family for the year. Some of the peaches weighed 10 or 12 ounces.

Yakima Valley Federation of Women's Clubs.

Mrs. Jean K. Gawler, chairman, Home Economics Division General Federation of Women's Clubs, has kindly sent in for the RECORD readers a résumé of the semiannual meeting of the Yakima Valley Federation at Zillah, Wash., on October 26.

About 125 clubwomen were present and presented a varied and interesting program. As a result of the speeches, discussions and demonstrations they outlined their attitude and work for the coming months.

The resolutions approved the action of President Harding toward securing the cooperation of the various nations for the reduction of armament, and went on record, as clubwomen, toward educating the public to the need for disarmament; requested Congress to give the Sheppard-Towner maternity bill serious consideration, requested the State legislature to make the State of Washington eligible to Federal funds under this bill; endorsed the work of nutrition inaugurated in a few schools and urged that it be extended by the clubs of the valley through the purchase of scales and milk; heartily supported the bill advocating the county library unit; put the federation on record as continuing to work for the prevention of pollution of

the Yakima River by sewage or otherwise, by the immediate appointment of a committee cooperating with other communities working to this end; endorsed the reestablishment of the Women's Industrial Home at the earliest possible moment; requested the health committee of the State Federation to investigate sanitary conditions surrounding public schools and to have undesirable conditions corrected.

A demonstration of the proper dressing of young girls was most popular, and other important problems were handled in a way that was interesting and instructive. Altogether it was voted a most successful meeting.

A Tribute to the Reclamation Service Engineers.

Several years ago a woman from the Department of Agriculture was sent West to study market conditions, with special reference to their relation to women, and rural women's organizations. Her work carried her to the Newlands project, and after a visit to Lahontan Dam she recorded the vivid impression it made upon her as follows:

The Finished Work.

By Caroline B. Sherman.

As far as eye can see are wide, unbounded stretches of desert, all of dead ash color. The deepening water in the great reservoir reflects the same neutral hue. The weathered tone of the concrete masses, the khaki clothes of the few attendants, the day's dust settling everywhere, all contribute to the monotone of the great picture, but here and there it is relieved by brilliant touches of red-orange, painted in on the giant framework. Such is the panorama from the broad bridge that crowns this colossal piece of construction.

In keeping with the harmony of the tones in the picture is the physical interrelation of the parts in real life. The massive concrete structure, built for coming decades, conserves the water from the reluctant rivers and conducts it slowly by safe channels down through the thirsty regions of desert land to that part of the valley which has already begun to blossom with food for man and beast. When changing seasons fill the reservoir to overflowing, the giant spillways will do their part in this great scheme for harnessing the hitherto irreconcilable forces of nature. And year by year as the waters gather, a greater acreage will be transformed from barren land to garden.

In the shelter of a desert dune lies the little camp of temporary homes, weatherbeaten and seemingly so frail that the hot, incessant desert winds must surely blow them to fragments. In one of these for five years has dwelt the faithful little family of the construction engineer. Wind-blown, sunburned, cheery, enthusiastic, mother and small but stalwart sons welcome the visitors to the cottage.

Within are the same colors as without, but in darker, warmer, and more homelike tones. Brown walls, brown woods, big, brown, and commodious built-in furniture are here, brown skins and other trophies of the wild country, relieved by the rich coloring of scattered books and magazines, intensified and concentrated on dull days in a cheerful blaze in the huge stone fireplace.

Already the work of demolishing these rude but trusty little pioneer homes is begun. The walls that have sheltered the hopes and fears, joys and discouragements that attend all great undertakings are at last meeting defeat at the hands of their destroyers and are welcoming to their interiors the winds of the great open since the dwellers therein have gone to begin other work of reclamation. Down at the spur track huge dredges, engines, and machinery of gigantic size and unknown possibilities are loaded for shipment to the next scene of struggle with aridity.

The work is done. Each part of the great plan proclaims it. And who shall say how many generations born and reared in this new land of breadth and promise shall rise up in the course of coming decades to call its constructors blessed?

Clear Up, Clean Up, Cheer Up!

READ THIS, IT'S DIFFERENT.

The Las Cruces, Rio Grande project, Chamber of Commerce, staged a clean-up for the afternoon of Armistice Day, and the women of the town agreed to help make it effective. The plan was for every able-bodied man to don overalls and do his share toward beautifying the town.

The program called for cutting weeds in vacant places, cleaning up unsightly spots, repairing sidewalks and fences, and the planting of trees and shrubs. A committee was appointed to round up the slackers and parade them through the streets in a cage. A kangaroo court, presided over by a member of the bar, was appointed to mete out fitting fines and punishment.

The City Beautiful Committee districted the town and appointed subcommittees of men and women to take charge of the separate districts. The slogan was "Clear up, clean up, cheer up." The big idea was to make the town more presentable to the visitors and to prospective settlers, and to keep it so in the future. The committee will be permanent.

The plan in its entirety includes an adequate lighting system, sidewalk construction, street improvement, and the building of substantial bridges over the irrigation canals.

This is a marked improvement over the popular once a year clean-up spasm which provides for a thorough cleaning out of unsightly and unsanitary places and then forgets all about it until an accumulation of trash makes another clean-up imperative.

A Unique Mortgage Lifter.

The truckers of El Paso Valley, Rio Grande project, spent a busy October preparing for a spring crop that has never had a bad year in their section and has proved to be in first rank as a mortgage lifter and automobile buyer. This miracle worker is the fra-

grant sweet pea, which, by reason of lack of organization among the growers, sells at 10 cents a bunch.

Seed dealers say they can not estimate the amount of land being soddied in sweet peas, but it is claimed that there are more sweet peas grown in the open about El Paso than in any other city in the United States. They are grown by nearly everybody, farms, truck gardens, and suburban yards producing masses of delicate blossoms throughout early spring and well into the summer season. The winter flowering varieties come into bloom about January and are plentiful enough in February to sell at 25 cents a bunch, when eastern wholesalers are getting about four times that amount. Several small growers around Val Verde have been making from \$500 to \$1,500 a season with their sweet peas, despite the crudest and most primitive kind of marketing. Enough sweet peas went to waste in El Paso Valley last season to supply every florist in Texas.

The blooming season extends to about the 1st of July, when the ground is cleared and planted to vegetables. The peas enrich the soil so that the vegetables thrive mightily, and when fall comes around again the sweet pea seed is put in immediately for a winter crop. The growers claim they can produce as much in a back yard flower bed as ordinary field crops do in an acre.

The pioneer sweet pea grower of the valley is W. D. Goss, a mail carrier, with a suburban home about half way between El Paso and Ysleta. Last spring Mr. Goss spent \$2,000 on a greenhouse for winter blooming peas. A hail storm demolished this but so profitable has Mr. Goss found the delightful occupation that he has reconstructed the house. The giant Spencer type, sorted by varieties and colors, is the favorite flower.

Sleep.

For a number of years women's clubs and various other organizations have been carrying on a propaganda through the press for improving the general health standards of the country. The diet, clothing, schooling, etc., have each received much thought and attention, but of "Sleep, which knits up the raveled sleeve of care," little has been said.

True, the intelligent mother opens the windows nights, and some of them get the children in bed at an early hour. Sleep is considered almost wholly from the physical side. It has a psychic side, however, which must not be overlooked. This aspect of the subject is a little too deep to enter upon here, but it need not, therefore, be entirely disregarded. While making the physical conditions of sleep as nearly ideal as possible, it is entirely practical to take into consideration the welfare of the mind.

The infant sleeps most of its time, lessening the amount during its years of growth until at maturity 8 hours of each 24 are considered the requisite time

for sleep. Your doctor or the advisers in the "better-babies" campaigns can give you a schedule for the different years of age. So much for the amount of sleep. Of its quality, which is hardly less important, mothers should give considerable attention. Surely the way in which at least one-third of life is spent should be considered a matter of much importance.

SLEEPING CONDITIONS.

Absolutely ideal sleeping conditions are hardly possible for the average family, for they would call for a separate room for each individual. Indeed a separate bed for each is impossible for the great majority, even a separate bed or couch with two or three in the same room. The next best thing calls for wise planning in the matter of bedfellows, placing in the same bed those of as nearly the same age and physical condition as possible.

Let the sleeping room be a simple one, well ventilated, free from dust-gathering draperies or hangings, and receiving an abundance of sunshine at some time during the day. A hardwood or painted floor with a few simple rugs is attractive and easily kept free from germ laden dust. Wool blankets or wool filled quilts give a great deal of warmth with a minimum of weight. A down filled quilt, a great luxury in town, need not necessarily be expensive on a farm where geese are kept.

The school child is usually ravenously hungry at supper time, and he should either have an early supper or a drink of hot milk or bowl of hot soup, anything simple and nourishing, upon reaching home to sustain him and also to prevent the eating of too heavy a meal later.

A nice warm bath or at least a scrubbing up before going to bed is important, as well as fresh sleeping robes.

So much for the physical conditions.

Send the children to bed happy.

If there must be punishments get them over and good feeling established before tucking the kiddies in for the night. Let whatever unpleasant experiences the day may have brought be swept away with the good-night kiss.

Don't let family dissensions burden the impressionable childish mind. This is most important, and both parents should agree that when they are not of one mind on a subject the matter should not be threshed out in the presence of the children.

Don't burden the children with financial worries. Teach them thrift and economy by all means, but keep the worry from them as long as possible.

Don't let small children study at night. If the school work of a small child demands home study there is something radically wrong in its arrangement. Such work as the older children have to do should be gotten out of the way as early as possible,

and be followed by a period of relaxation and pleasure—reading, music, or games.

And lastly, whatever else may be unavoidable, keep all kinds of fear from their minds. But that is a subject all by itself. Send them to bed happy. It is a great factor in health and character building.

Catching Cash for Clubs.

An organization of women on the Sunnyside Division of the Yakima project performed a real service for local women recently and at the same time raised funds to defray charges on packages sent to the marine hospital. They held a "Kitchen Holder Day." A booth was put up in a prominent place and from it were sold holders of every shape, kind, and color. There were big ones and small ones, plain ones and dainty ones, pretty enough and useful enough for a bride or for Christmas. The best thing about the

display was that it didn't cost anyone a cent, just a little time and some searching in scrap bags, and the good deed was done.

Car of Foodstuffs Sent to Children's Home.

The citizens of Sunnyside, Yakima project, and surrounding country contributed a car of foodstuffs totaling about 20,000 pounds of eatables which will furnish some variety to the children in the Seattle Home. There were 75 sacks of potatoes, 108 boxes of apples, 4 boxes of pears, 3 sacks of beans, squash and pumpkins and carrots and rutabagas galore, 9 sacks of flour, 2 cases canned apples in tins, 4 barrels canned fruits, and 8 boxes corn and cabbage, lard and meat, onions, and clothing, etc. It takes Sunnyside to do the thing up brown when they take up a project calling for cooperation and good will.—*L. L.*

ENGINEERING INVESTIGATIONS.

Wood-stave Pipe on Projects of the Reclamation Service.

By William H. Nalder, Engineer, Denver Office, U. S. R. S.

ON November 15, 1920, General Letter No. 182 was sent from the chief engineer's office to all project managers presenting for answer a questionnaire regarding all installations of wood-stave pipe on the projects. The information asked for was as follows:

- (a) Location and designation of pipe line.
- (b) Diameter of pipe.
- (c) Length of pipe.
- (d) Type of pipe, whether machine-banded or continuous.
- (e) Kind of material, whether redwood or fir.
- (f) Maximum head on pipe.
- (g) Date pipe was installed.
- (h) Is pipe buried or above ground?
- (i) What is present condition of pipe?

Replies were received from all projects and the information contained therein has been assembled on drawings Nos. X-C-160, sheets 1 to 5, inclusive. These drawings are on file in the office of the chief engineer and give the data by projects without regard to the type of construction or date of installation.

Data were supplied by 18 separate projects and covered 196 separate installations of pipe, and were therefore assembled by not less than 18 different men. These men used comparatively general terms ranging from "perfect" to "no good," as given in the first column of Table No. 1, in describing the condition of the pipe. Therefore, a considerable personal element must have entered into the selection by each man of the various comparative terms used, such as "good," "fair," "poor," "bad," etc. And it can well be seen that a pipe described, for instance,

as in poor condition on one project might be placed under some other classification on another project or by another man. However, taking the classifications as given, Table No. 1 shows the actual and relative number of installations and amount of pipe under each classification, arranged in progressive order from "perfect" to "no good." This table shows this grouping under the headings of "All installations," "1910 and earlier," "1911 to 1915, inclusive," and "1916 to 1920, inclusive."

To eliminate as much as possible the personal element entering into the use of the terms ranging from "perfect" to "no good" in describing the condition of the pipe the data have also been grouped under the two headings "fair or better" and "poor or worse." It is thought that all pipe described as being in a fair or better condition is still giving satisfactory service and that all pipe described as in a poor or worse condition was not at the time of examination giving satisfactory service, although it may have been doing so shortly before that time. This segregation and grouping is shown in Table No. 2 under the same general headings as to dates of installation as those used in Table No. 1. This grouping is also shown for each of the various types of construction as well as for all types combined.

It is realized that with only such general information and without a detailed knowledge of all the circumstances surrounding the installation and operation of the pipe lines one should be very cautious in drawing decided conclusions. More just and accurate conclusions could probably be arrived at from a more complete study of a few selected representative instal-

lations than from the larger mass of general and more or less superficial data available. However, a few general observations are presented herewith.

1. One condition which, while not universal, is in general quite typical of the operation of pipe lines in the Reclamation Service is that they are full of water only part of the time. This condition is generally recognized to be conducive to the early decay and destruction of wood pipe.

2. Many installations of wood pipe in the Reclamation Service are in soils that are more or less heavily impregnated with alkali and carry alkali-laden water. This contact with alkali appears to have resulted in several instances in the early destruction of the steel bands and wire winding of the pipe.

3. There are 65 installations reported as being made between the years of 1916 and 1920, all but three or 95.4 per cent of which are reported as in fair or better condition. The three installations reported in poor or worse condition were made in 1916 and 1917 and

were of untreated fir staves placed in moist earth and kept full of water during the irrigation season only. They were in sizes of 10 and 12 inches and are under maximum hydrostatic heads of 10 and 15 feet.

4. Of the 59 installations made during the period of 1911 to 1915, inclusive, 50, or 84.7 per cent, are reported as in fair or better condition. Of the 9 in this group reported as being in poor or worse condition, 2 are of untreated fir in moist earth, full during the irrigation season only, 1 is redwood buried in alkali soil that has destroyed the winding, 2 are untreated continuous fir laid in gravelly soil, and for 4 no information is at hand as to nature of soil or continuity of service.

5. Of the 71 installations made during the period of 1910 and earlier, 54, or 76 per cent, are reported in fair or better condition. There are 3 installations made in 1901 and 1 in 1904 which are all the installations reported as being made prior to 1905. All of these are reported to be in fair condition, although all are reported as having been moved and relaid.

Table No. 1.

Condition.	All installations.				1910 and earlier.				1911 to 1915, inclusive.				1916 to 1920, inclusive.			
	Installations.		Amount.		Installations.		Amount.		Installations.		Amount.		Installations.		Amount.	
	Number.	Per cent.	Length, feet.	Per cent.	Number.	Per cent.	Length, feet.	Per cent.	Number.	Per cent.	Length, feet.	Per cent.	Number.	Per cent.	Length, feet.	Per cent.
Perfect.....	1	0.5	1,030	0.3					1	1.7	1,030	0.9				
Excellent.....	7	3.6	16,182	3.9					3	5.1	12,046	10.1	4	6.2	4,136	2.9
Very good.....	7	3.6	6,913	1.7					3	5.1	4,158	3.5	4	6.2	2,755	1.9
Good.....	120	61.5	220,851	53.7	34	48.0	42,951	29.2	32	54.2	46,649	39.1	54	83.2	131,251	90.6
Fair.....	31	15.9	65,687	16.0	20	28.0	43,579	30.2	11	18.6	22,108	18.5				
Poor.....	17	8.7	69,781	17.0	7	9.9	34,372	23.4	7	11.9	28,669	24.1	3	4.6	6,740	4.6
Very poor.....	5	2.6	9,603	2.3	4	5.6	9,091	6.2	1	1.7	5,122	0.4				
Bad.....	1	0.5	3,930	1.0					1	1.7	3,930	3.3				
Almost useless.....	4	2.1	15,721	3.8	4	5.6	15,721	10.7								
No good.....	2	1.0	1,087	0.3	2	2.8	1,087	7.3								
Total.....	195	100.0	410,785	100.0	71	100.0	146,801	100.0	59	100.0	119,102	100.0	65	100	144,882	100

Table No. 2.

Construction.	All installations.				1910 and earlier.				1911 to 1915.				1916 to 1920.			
	Fair or better.		Poor or worse.		Fair or better.		Poor or worse.		Fair or better.		Poor or worse.		Fair or better.		Poor or worse.	
	Lines	Length, feet.	Lines	Length, feet.	Lines	Length, feet.	Lines	Length, feet.	Lines	Length, feet.	Lines	Length, feet.	Lines	Length, feet.	Lines	Length, feet.
Wire-wound fir staves:																
Buried.....	93	144,560	22	76,866	43	61,440	13	46,151	21	32,179	6	23,975	29	50,941	3	6,740
Above ground.....	27	44,191	2	1,087	5	5,188	2	1,087	7	13,006			15	25,997		
Wire-wound redwood staves, buried.....	2	38,649	1	512					1	1,727	1	512	1	36,922		
Continuous fir staves:																
Buried.....	14	26,445	2	8,624	1	3,500			11	22,162	2	8,624	2	783		
Above ground.....	22	45,760	2	13,033	5	16,402	2	13,033	10	16,917			7	12,441		
Continuous redwood:																
Buried.....	1	450											1	450		
Above ground.....	7	10,608											7	10,608		
All types.....	166	310,663	29	100,122	54	86,530	17	60,271	50	85,991	9	33,111	62	138,142	3	6,740
Totals in percentages.	85.1	75.6	14.9	24.4	76.0	59.0	24.0	41.0	84.7	72.2	15.3	27.8	95.4	95.4	4.6	4.6

6. Of the 29 installations of all periods reported in poor or worse condition, 18 describe no circumstance surrounding their construction or operation that might be taken as the reason for their unsatisfactory state. The remaining 11 installations record reasons such as "full during irrigation season only," "installed in gravelly soil," etc., that might be considered as causes for their failure, but which are also reported as existing in connection with installations giving satisfactory service. So the evidence is not conclusive as to why these installations have failed.

7. In stating the probable life of wood-stave pipe installed and operated under average conditions existing on the projects of the Reclamation Service, as indicated by these data, it is probably safe to say that there is an even chance or better that with some maintenance an installation will give 15 years of satisfactory service and that if unfavorable conditions are avoided there is a reasonable certainty that this satisfactory life will be not less than 10 years.

8. Reported conditions that apparently have tended to shorten the useful life of the pipe lines may be stated as follows:

(a) Intermittent service, pipes full of water during the irrigation season and empty during the non-irrigating season.

(b) Installations made in gravelly or open soils.

(c) Installations made in alkali soils resulting in destruction of the bands and wire winding.

(d) Installations using separate wooden collars at joints. These collars tend to rot out while the pipe proper remains in good condition owing evidently to the fact that the collars are not so thoroughly saturated in service as the walls of the pipe.

(e) Installations under low hydrostatic heads—say less than 15 feet—which are not sufficient properly to saturate the wood.

BULLETINS FOR THE FARMER.

Distributed by the Department of Agriculture,
Washington, D. C.

FARMERS' BULLETINS.

No.

1207. Milk and its uses in the home.

1221. Standard varieties of chickens. The ornamental breeds and varieties.

1232. Seed marketing hints for the farmer.

In general, in beautifying the farm, the first thing to do is to clean up, to place the wood pile in an inconspicuous place, to get rid of broken-down, worn-out farm machinery and vehicles, and to gather up loose boards and stones.

FEDERAL RECLAMATION APPROVED.

Committee on Emergency Public Works Recommends Loan for Construction.

THE following concerning Federal reclamation is taken from the report, dated October 12, 1921, of the Committee on Emergency Public Works of the President's Conference on Unemployment:

Since the administration of President Roosevelt it has been Federal policy to make all irrigable and reclaimable lands available for settlement on terms which aim to insure a real opportunity for the settler and ultimate reimbursement to the Federal Treasury of all construction expenses.

Reclamation construction is provided for by a reclamation fund which is constantly replenished by payments from land users, oil leases, etc. Any appropriations to this fund by Congress are in the nature of a loan to be repaid to the Federal Treasury from monies received after construction has been completed.

The Reclamation Service work is especially adapted to the stabilizing of employment conditions. Even on the most northern projects such operations as tunneling, rock work, and heavy excavations can be carried on successfully throughout the winter.

Reclamation Service projects already begun would afford employment to about 32,000 workers, directly and indirectly, during this winter, if funds were available.

An appropriation by Congress in the form of a loan to the reclamation fund of \$16,200,000 for expenditure on projects now under way would be utilized in immediate construction this winter, providing direct employment for 16,000 workers, without committing the Reclamation Service to further expenditures.

The above total of 16,000 men employed directly would be increased by about 16,000 additional required in the manufacture and moving of materials, making a total of 32,000 men who would be employed this winter.

Fully realizing the need for true economy in Federal expenditures, your committee believes that such a policy is not inconsistent with the loan of Government funds during the present period of industrial depression for the purpose of increasing the agricultural area of the United States, and recommends that reclamation developments be continued more intensively during the winter 1921-22.

Your committee therefore earnestly recommends to Congress the immediate consideration of a loan to the reclamation fund for the prosecution of projects already under way.

Organization among farmers means better farming. Many heads are better than one. With organization must go cooperation, and there is sure to follow better business, for if anything is clear in modern business life it is that the man who stands alone is working at a disadvantage.

"Just a-going to" does not keep out skunks nor mend leaky roofs that rain in croup and roup; nor powder the old hen; nor clear out mites and lice. "Just a-going to" is a thief.



Members of Water Users' Association Not Personally Liable for Assessments.

NEITHER the articles of incorporation nor the by-laws of the Payette-Boise Water Users' Association (Boise Federal Irrigation Project, Idaho) nor the stock subscription contracts made by its members, contains an agreement to pay assessments, and therefore there is no personal liability on the part of the members to make such payments. (Opinion State District Judge B. S. Varian, Oct. 11, 1921, in *Payette-Boise Water Users' Association v. Mercer*, citing *Wall v. Basin Mining Co.*, 16 Idaho, 328; 101 Pac., 733.)

Assessments by Water Users' Association Must Follow State Law.

The provisions of the articles of incorporation and by-laws of the Payette-Boise Water Users' Association (Boise Federal Irrigation Project, Idaho) and of the stock subscription contracts made by its members, are merely declaratory of State law, and the direction of the latter must be followed in order to enforce the lien of an assessment made against a member. (Opinion State District Judge B. S. Varian, Oct. 19, 1921, in *Payette-Boise Water Users' Association v. Griffiths*.)

Entry of Lands Within Federal Irrigation Projects.

Under the act of June 25, 1910 (36 Stat., 835), as subsequently amended, lands reserved for irrigation purposes are not subject to settlement or entry until the Secretary of the Interior shall have established the unit of acreage per entry and announced that water is ready to be delivered, and no exception to the rule can be made in favor of an applicant who seeks to make an additional entry of such lands in the exercise of a preference right acquired by contest. Section 24 of departmental regulations of May 18, 1916 (45 L. D., 385, 390), are obsolete and inoperative. (Bert Scott, North Platte project, 48 L. D., 85; 48 L. D., 113.)

Limitations on Government Leases.

As officers of the Government are prohibited by section 3679, Revised Statutes, as amended, limiting

expenditures of the Government departments to the appropriations for the fiscal year, from executing a lease to run beyond the end of one fiscal year, except when specifically authorized by law, the legal effect of a lease for five years and four months was to bind the United States only to the end of the first fiscal year, with an option from year to year until the end of the term, and the termination of the lease at the close of the first fiscal year did not constitute a breach of contract on the part of the United States which could be made the basis of a claim for damages. (1 Compt. Gen., 10.)

Survey of Public Lands Bordering on a Lake.

In a Government survey of public lands bordering on a body of water or water course, a meander line is properly run for the purpose of computing acreage of fractional lots; but the lake or water course, and not the meander line, is the true boundary, and the survey is not invalidated by the failure to include within the meander lines small, irregular areas of land. Where in the survey in 1839 of public lands bordering on a lake in Louisiana, which is still in existence, a meander line was run which was approximately accurate, though it included some small points of water extending into the land, and excluded some small pieces of land, the United States held not entitled, after the land became valuable for oil, to claim the areas of land outside the meander line as unsurveyed Government land, as against the grantees of the tracts surveyed. (Lane et al. v. United States, 274 Fed., 290.)

Assessment of Railroad Lands in Irrigation Districts.

The following is taken from the syllabus of the opinion in *Northern Pacific Railway Co. v. Walla Walla County et al.* (200 Pac., 585), by the Supreme Court of the State of Washington, relating to the assessment of a railroad right-of-way within an irrigation district:

The mere fact that land is within the boundaries of an irrigation district does not necessarily mean that it is capable of receiving benefit from the maintenance of the irrigation system in the district in the sense of becoming liable to contribute toward the maintenance of the irrigation system.

Under Rem. Code 1915, sec. 6452, providing for assessment of land in irrigation district for maintenance of the irrigation system, and section 6433, providing that assessments "shall be made in proportion with the benefits accruing to the lands assessed," and notwithstanding section 6432, land owned by a railroad within the district, not susceptible of irrigation and cultivation on account of its nature and topography, could not be assessed for maintenance of the system, since the irrigation could not, under any circumstances, result in any benefit to such land.

Owner of land in irrigation district, required to pay assessment for maintenance of irrigation district though land was not benefited thereby, could recover the amount paid, since the charge of assessment on such land worked a legal fraud upon the owner.

Liability for Seepage in California.

The following holding relating to liability of a canal owner for damages on account of seepage is taken from the opinion of the district court of appeals, third district, California, in *Tormey et al. v. Tormey-Cottonwood Irr. Dist.* (200 Pac., 814), to wit:

To knowingly construct a canal through loose sand or gravel incapable of holding water, in a situation such as that disclosed here, without taking any steps to prevent or control seepage therefrom, would constitute negligence. (*Tuimper v. Turlock Irrigation Dist.*, 141 Cal. 1, 74 Pac. 295; *Shields v. Orr Extension Ditch Co.*, 23 Nev. 349, 47 Pac. 195.) If, in the actual operation of a canal, sudden and unexpected damage results by reason of some hidden defect which could not reasonably have been foreseen, the owner would not be liable in damages, because he is not an insurer, but chargeable only in case of negligence. (*Sutliff v. Sweetwater Water Co.*, 182 Cal. 34, 186 Pac. 766.) After discovery of the defect, however, and after reasonable opportunity to correct it, if the owner continue the use, his liability for subsequent damages would be the same as if he had known of the defect at the time of construction.

In denying a hearing in this case, the State Supreme Court of California made the following observation:

The canal is constructed for public purposes and to serve the purpose of distribution of water to public use. Apparently the damage to the plaintiffs is caused directly by seepage of water carried in said canal through the intervening soil onto the adjoining land of the plaintiffs. In such cases the plaintiff is secured a right to damages by the constitutional provision that private property shall not be damaged for public use. (Art. I, section 14.) In such cases the care that may be taken in the construction of the public improvement which causes the damage is wholly immaterial to the right of the plaintiff to recover damage, if the improvement causes it. This was expressly decided in *Reardon v. San Francisco*, 66 Cal., 505, 6 Pac. 317, 56 Am. Rep., 109, and *Eachus v. Los Angeles*, 103 Cal., 614, 37 Pac., 750, 42 Am. St. Rep., 149.

Bills Relating to Federal Reclamation.

IN THE HOUSE.

H. R. 4382.—"A bill to provide for the application of the reclamation law to irrigation districts." Bill favorably reported out of committee October 21, 1921.

H. R. 8719.—"A bill providing for advances to the reclamation fund." Introduced October 15, 1921, by Representative Addison T. Smith of Idaho. This bill authorizes a transfer from the General Treasury to the reclamation fund of \$20,000,000. It is similar to S. 2600.

H. R. 8815.—"A bill to authorize certain homestead settlers or entrymen on United States reclamation projects who entered the military or naval service of the United States during the war with Germany to make final proof of their entries." Introduced October 24, 1921, by Representative John E. Raker of California.

H. R. 8997.—"A bill to promote the public welfare by improving public highways, roads, rivers and harbors, and reclaiming idle, arid, waste, or unimproved lands in the United States and its Territories by irrigation and otherwise, and for other purposes." Introduced November 3, 1921, by Representative John M. Morin of Pennsylvania.

IN THE SENATE.

S. 2552.—"A bill for the relief of Cecil Pritchard and Monroe Pritchard." Introduced October 4, 1921, by Senator Henry L. Myers of Montana. This bill provides for an appropriation from the General Treasury of \$10,000 as compensation for injuries sustained by Cecil Pritchard and Monroe Pritchard as the result of an explosion of dynamite caps February 23, 1921, on the Flathead Indian Federal irrigation project, Montana.

S. 2553.—"A bill for the relief of James Harrington." Introduced October 4, 1921, by Senator Henry L. Myers of Montana. This bill would appropriate from the General Treasury the sum of \$5,000 as compensation for injuries sustained by James Harrington in connection with the accident referred to in S. 2552.

S. 2586.—"A bill to permit holdings of other lands by owners of units of land within and part of a Federal reclamation project." Introduced October 14, 1921, by Senator Henry L. Myers of Montana.

S. 2600.—"A bill providing for advances to the reclamation fund." Introduced October 14, 1921, by Senator Charles L. McNary of Oregon. This bill is similar to H. R. 8719.

S. 2611.—"A bill to relieve unemployment through continuance of construction work on the San Carlos Federal irrigation project in Arizona, and for other purposes." Introduced October 20, 1921, by Senator Henry F. Ashurst of Arizona. The bill provides for a transfer of \$4,000,000 from the General Treasury to the reclamation fund for construction of the above-named project.

S. 2700.—"A bill for the immediate construction of approved reclamation projects." Introduced November 8, 1921, by Senator Miles Poindexter of Washington. This bill would transfer the sum of \$16,200,000 from the General Treasury to the reclamation fund for carrying on construction work on approved projects.

—Ottamar Hamele.

A little attention at the right time and in the right way has much to do with keeping down weeds. It doesn't pay to give the thrasher good money for thrashing weed seeds, pay the railroad company for hauling them, only to have them deducted at the selling end. It is wiser not to grow them.

BOOKS REVIEWED.

PROGRESS IN NATIONAL LAND RECLAMATION IN THE UNITED STATES. By C. A. Bissell, engineer, Reclamation Service. Illustrated pamphlet of 25 pages, being extract from the annual report of the Smithsonian Institution for 1919, pages 497-522, for free distribution.

This pamphlet is a reprint of an article appearing in the annual report of the Smithsonian Institution for 1919, and includes a discussion of the progress of the work of the Reclamation Service, including advantages of irrigation farming, a discussion of the permanency of the settlers on the projects, results of construction to date, the operations on the 30 projects under operation by the service, and discussion of crops with statistics for the year 1919.

There is also included a discussion of the investigation of swamp and cutover lands made by the Reclamation Service in 1918, in accordance with a clause inserted in the Sundry Civil Bill making an appropriation of \$100,000 for this purpose. It is interesting to note that this is the only time the Reclamation Service has done work of this nature east of the Mississippi River, as the work of this service is confined by the organic act to the investigations and construction and operation of irrigation projects in the arid and semiarid States of the Far West.

There is also included, in addition to tables of crop production, a table giving a list of projects and extensions of projects that have been investigated in recent years by the Reclamation Service, which number nearly 100.

The illustrations include those of several of the dams constructed by the service, power houses, canal construction, methods of irrigation, and a map showing the location of the irrigation projects.

BUREAU OF THE BUDGET.

Digest of Orders and Circulars.

Circular No. 39, October 10, 1921.—Transmitting memorandum from Secretary of Commerce relative to making wider use of census tabulating machinery.

Circular No. 40, October 11, 1921.—Calling for estimate of amount of "repay" printing work which will be actually required during fiscal year 1923.

Circular No. 41, October 10, 1921.—Establishing Federal Traffic Board to make a complete study of traffic problems of the various departments, etc., of the Government with chairman under title of Coordinator for Traffic, under general supervision of the Chief Coordinator for General Supply, selecting necessary committees, directing time and place of meetings, and order in which elements of problem shall be considered. Instructing head of each department to designate at once one representative to service as member of Federal Traffic Board. All questions pertaining to the classification of materials or terminal, switching, freight rates, etc., which require application of remedial measures will be submitted to Coordinator for Traffic for adjustment with classification committees representing carrier or presentation of complaint with Interstate Commerce Commission—final decision in case of disagreement to be by Chief Coordinator for General Supply. Mr. C. E. Harris, of the Reclamation Service, has been designated Interior Department representative. Memo of October 12 unnumbered, on same subject.

Circular No. 42, October 10, 1921.—Establishing Federal Specifications Board to compile and adopt standard specifications for materials and services and bring specifications into harmony with best commercial practice wherever possible. Director of the Bureau of Standards designated as ex officio chairman of board. Instructing head of each department and establishment to designate one representative to service as member of Federal Specifications Board and such assistants as are deemed necessary, notifying Chief Coordinator for General Supply of selection.

Circular No. 43, October 17, 1921.—Designating Commander C. G. Mayo, U. S. Navy, as Coordinator for Traffic, to undertake new duties at once.

Circular No. 44, November 1, 1921.—Establishing a Federal Board of Hospitalization to coordinate separate hospitalization activities of Army, Navy, Public Health Service, St. Elizabeth's Hospital, National Home for Disabled Volunteer Soldiers, Office of Commissioner of Indian Affairs, and United States Veterans' Bureau, listing officials to compose board, and stating duty of board.

Circular No. 45, November 3, 1921.—Designating Gen. Charles E. Sawyer as Chief Coordinator of the Federal Board of Hospitalization.

OCTOBER WEATHER IN THE WESTERN STATES.

By P. C. Day, United States Weather Bureau.

October was decidedly warm and dry. There was a little cold weather early in the month, mainly in the northern portions, then for many days no break of importance occurred in the mildness. But during the final decade some cold weather visited parts of the West, chiefly those portions lying west of the Continental Divide. Throughout the West the month averaged warmer than normal, usually by several degrees, with greatest abnormality, about 6° to 8°, in the northern Rocky Mountain States and the western parts of the Dakotas.

The weather conditions were decidedly favorable for most kinds of outdoor work, but in several portions the dryness hindered plowing and the seeding of small grains. Live stock nearly everywhere did very well. Harvesting of potatoes and sugar beets was favored by the weather, and there were scarcely any crops of importance that suffered seriously from frost and freezing weather.

Time was when it was considered the proper thing to buy any kind of cattle and raise them outdoors the year around. Now it is known that it pays better to get well-bred animals and give them good care.

MONTHLY PROGRESS REPORTS FOR OCTOBER, 1921.

Monthly conditions of principal Reclamation Service reservoirs for October, 1921.

[Elevation above sea level.]

State and project.	Reservoir.	Available capacity in acre-feet.	Elevation.		Storage in acre-feet.			Out-flow in acre-feet.	Elevation of water surface.		
			Spill-way crest. ¹	Lowest gate sill. ²	Beginning of month.	End of month.	Maximum.		Beginning of month.	End of month.	Maximum.
Arizona, Salt River.....	Roosevelt ³	1,305,000	2128	1903	678,691	643,119	678,691	.....	177.16	174.08	117.16
California, Orland.....	East Park.....	51,000	1199.68	1111.68	8,720	7,520	8,720	1,045	1177.15	1161.22	1177.15
Idaho:											
Boise.....	Arrowrock.....	280,000	3211	2956	23,950	19,190	23,150	51,476	3064	3055	3064
	Deer Flat.....	177,000	2518	2488	35,542	35,107	35,542	6,990	2498.49	2498.38	2498.49
Minidoka.....	Lake Wolcott.....	95,180	4245	4236	53,750	81,740	81,740	272,759	4241.30	4243.84	4243.84
	Jackson Lake.....	847,000	6769	6730	170,250	194,800	194,800	.....	6739.37	6740.62	6740.62
Montana:											
Milk River.....	Nelson.....	27,000	2214	2200	23,600	21,760	23,600	.....	2211.3	2210.6	2211.3
St. Mary storage.....	Sherburne.....	66,000	4788	4720	28,000	2,500	28,000	22,500	4860.4	4830	4890.4
Sun River.....	Willow Creek.....	16,700	4130	4085	7,270	7,326	7,326	.....	4118.4	4118.5	4118.5
Nebraska-Wyoming, North Platte.	Pathfinder.....	1,070,000	5852	5670	573,750	529,290	573,750	68,904	5823.74	5820.28	5823.74
	Lake Alice.....	11,400	4182	4159	4,118	7,829	7,829	.....	4170.6	4177	4177
	Lake Minatare.....	60,766	4125	4074	29,009	55,480	55,480	.....	4108	4122.5	4122.5
Nevada, Newlands.....	Lake Tahoe.....	120,000	6230	6224	.....	.....	.....	19,856	6225.35	6224.95	6225.35
	Lahontan.....	290,000	4162	4060	155,560	154,990	155,560	9,840	4146.80	4146.70	4146.80
New Mexico:											
Carlsbad.....	McMillan.....	45,000	3267.7	3246.0	37,600	29,000	37,600	13,000	3266.5	3264.7	3266.5
Rio Grande.....	Elephant Butte.....	2,638,860	4407	4231.5	1,990,459	1,905,298	1,990,459	83,000	4389.40	4386.40	4389.40
Oregon, Umatilla.....	Cold Springs.....	50,000	621.5	560	2,625	1,550	2,625	1,131	570.74	567.29	570.74
Oregon-California, Klamath.	Clear Lake.....	462,000	4540	4514	342,000	334,000	342,000	.....	4535.32	4535.03	4535.32
South Dakota, Belle Fourche	Belle Fourche.....	203,000	2975	2920	72,860	76,930	76,930	.....	2954.2	2955.1	2955.1
Utah, Strawberry Valley.....	Strawberry.....	250,000	7558	7514	215,400	210,400	261,520	5,000	7553.2	7552.5	7559.6
Washington:											
Okanogan.....	Conconully.....	14,400	2290	2232	1,100	1,613	1,613	154	2249.5	2251.7	2251.7
Yakima.....	Bumping Lake.....	34,000	3426	3389	11,760	8,730	11,435	3,030	3405.7	3401.9	3405.31
	Lake Cle Elum.....	22,800	2134	2122	26,000	27,610	27,705	95	2134.8	2135.5	2135.61
	Lake Kachess.....	210,000	2258	2192	106,580	112,020	112,020	.....	2229.4	2230.9	2230.97
	Lake Keechelus.....	152,000	2515	2425	29,990	31,965	31,965	.....	2442.2	2449.7	2449.78
Wyoming, Shoshone.....	Shoshone.....	456,600	5390	5132.3	417,703	408,971	417,703	25,750	5354	5352.6	5354

¹ Or maximum storage.² Or zero storage.³ Zero water depth at elevation 1902.2.⁴ Amount of silt shown by silt survey deducted from original capacity.⁵ Proposed regulation.⁶ Estimated low-water limit under proposed plan of regulation.⁷ Vested power draft.⁸ Elevation of reservoir raised 12 inches by stop logs in spillway.

SALT RIVER PROJECT, ARIZONA.

Operation and maintenance of irrigation system.—

Water was run in all of the canals during October. October 1 marked the beginning of the new irrigation season of 1921-22.

There were seven crews in the field during the month and the following statement shows the average number of men and stock employed and the results accomplished: Average number of men, 72½; average number of stock, 13½; miles main canal cleaned, 32.87; miles laterals cleaned, 156.50; old structures repaired, 130; linear feet stake and brush banks built, 1,787; cubic yards dirt fill placed, 277; cubic yards concrete placed, ½; and miles road graded, 4.

In addition to the above maintenance work, the Ruth Dredger, with a daily average of 3½ man days and 4 stock days, bermed 4,500 linear feet on the Western Canal in 6 working days, and 11,500 linear feet on the Grand Canal in 11 working days.

The following statement shows the construction work accomplished by the crews in the field: Average number of men, 115½; average number of stock, 79; new structures installed, 41; cubic yards concrete placed, 72; linear feet concrete pipe placed, 204; linear feet corrugated iron pipe placed, 918; miles new waste ditch built, 6.85; miles new waste ditch rebuilt, 2; miles irrigation ditch built, 1; and linear feet 16-inch well casing placed as road crossings, 144.

Work was continued on widening the Eastern Canal. The Monighan 2-yard machine, with a daily average

of 3½ men, and the Lidgerwood 1½-yard machine, with a daily average of 4½ men and 2 head of stock, moved 15,345 cubic yards of material.

Operation of power system.—The total power generated during the month was 7,461,430 kilowatt hours. The Roosevelt Power Plant operated continuously and generated 5,390,000 kilowatt hours. The Cross Cut Plant also operated continuously with a total output of 1,353,750 kilowatt hours. The Arizona Falls Plant operated 61 per cent of the month and generated 105,700 kilowatt hours. The South Consolidated Plant operated 97.7 per cent, generating 348,500 kilowatt hours, and the Chandler Plant operated 98 per cent, with an output of 263,480 kilowatt hours.

The substations all operated without trouble and all pumping plants were available for use as required.

Construction work.—Construction of the 11,000 volt power lines for the new pumping plants was started. Seventy-one holes were completed and 26-poles raised. Seventy-five poles were hauled from the storehouse yard to the job.

To date the drilling of three new wells has been completed and drilling of four others is under way.—*C. C. Cragin.*

YUMA PROJECT, ARIZONA-CALIFORNIA.

The break in the Main Canal, caused by the heavy rain at the end of September, was repaired, 63,000 yards of sand, gravel and earth having been moved in clearing out the canal and repairing the banks.

Construction.—On the South Drain the 30-B Bucyrus advanced 3,400 feet, excavating 14,000 cubic yards of earth; this machine was laid up 15 days during the month on account of a broken drum. A bridge was built over the drain on the road south of Gadsden. On the East Drain the type 14 Bucyrus advanced 3,100 feet, excavating 17,500 cubic yards of earth; a timber bridge and a metal flume were built across this drain.

Operation and maintenance.—The P. and H. dragline worked on cleaning the Main Drain until October 9, when it was transferred to the Mesa Division. On the Valley Division Ruth dredgers 7 and 9 were laid up for overhauling during the month; Ruth No. 8 cleaned 4 miles of laterals, excavating 5,600 cubic yards of silt. On the Reservation Division Ruth No. 6 cleaned one-quarter mile of lateral, excavating 375 cubic yards of silt. This machine was laid up for overhauling for all but two days of the month. The demand for water was light, only 5,500 acre-feet having been delivered to users.

It is probable that a large area in the project and on adjacent lands will be planted to grapes before next season.—*Porter J. Preston.*

YUMA MESA DIVISION, ARIZONA.

The crushing plant was operated almost continuously by a small force of men, the rock being used for concrete at the B Lift Pumping plant and the pipe plant. The casting of reinforced concrete pipe was started during the latter part of the month.

At the B Lift Pumping Plant concrete was poured for 288 linear feet of the 72-inch forcemain, and the concrete work was almost completed on the spillway. The 36-inch centrifugal pump was placed.

The excavation of the supply canal and the raising of the bank of the East Main Canal were practically completed.

Forms, base rings, lifting bands for concrete pipe and several cars of cement were received and hauled to the pipe manufacturing plant.—*Porter J. Preston.*

ORLAND PROJECT, CALIFORNIA.

The greater portion of the milo crop was gathered and resulted in a good yield. Most of the fifth and last crop of alfalfa was harvested.

Draft on East Park storage was discontinued on the 4th, at which time the 1921 operating season was closed. Water deliveries for the month amounted to 1,300 acre-feet. Maintenance work consisted of cleaning laterals in advance of the concrete lining work and in cleaning and repairing concrete lining.

Fall work of placing concrete lining under supplemental construction was resumed on the 20th. Six thousand nine hundred square yards of lining were placed on lateral No. 4.

At the California Floral and Horticultural Exhibition held at Los Angeles during October, Washington navel oranges, from the groves of Frank G. Rosenberger and Bernard Simonson on the Orland project, were awarded first and second prizes, respectively. This was the first occasion on which citrus products from the Orland project have been entered in competitive exhibition with those of Southern California orchards, and the result of Orland products being awarded first and second prizes for this variety of orange is of particular interest. Almonds grown by Guy Smith on his project orchard received first prize among the I. X. L. varieties of nuts displayed at the exhibition.—*R. C. E. Weber.*

GRAND VALLEY PROJECT, COLORADO.

The digging of sugar beets was under way throughout the month. The yield in general was better than in any previous year, and an unusually large tonnage will be secured from the project acreage. The harvesting of the apple crop over the valley was nearly completed. The quality and yield, both in the lower valley and on the project, were much better than average, and prices were satisfactory to the growers. The prices of wheat, oats, corn, and other general farm products were still at low figures and, while the yields of these crops were excellent, the returns were hardly sufficient to cover the cost of production. The first killing frost of the season occurred on the 26th, which put an end to the harvesting of tomatoes and garden produce.

The irrigation system was operated continuously, but the demand for water was light, being confined principally to the irrigation of land which was fall plowed and to a small acreage of winter wheat. Approximately 7,000 acre-feet of water were delivered to the project lands and the two irrigation districts. The repair work on the irrigation system, on account of the floods in August, was completed.

Construction work consisted of the installation of wooden structures on the lateral system and the completion of the ditchrider's house at the diversion dam. Small timber-treating plants were erected at the two maintenance camps. One P. and H. dragline worked one shift per day on the construction of project drain F-2 during the last half of the month. Thirteen hundred and eighty-five linear feet of drain were completed, involving 7,300 cubic yards of excavation.

The proposed contract with the Orchard Mesa Irrigation District was submitted to the directors, and a meeting of the landowners in the district was held on October 20, at which the provisions of the contract were explained by the project manager and district counsel. Action was taken by the district looking toward the calling of an election for vote on the contract in December.—*S. O. Harper.*

UNCOMPAHGRE PROJECT, COLORADO.

Practically all crops were harvested at the end of the month, except sugar beets. Nearly all thrashing was completed. All late potatoes were placed in storage, wherever such storage was available, on account of unsatisfactory prices. Much fall plowing was accomplished, and a large acreage was planted to winter wheat.

The demand for irrigation water was not very heavy.

The P. and H. dragline was engaged in making repairs to the flood-damaged banks of the Loutsenhizer Canal. The building of structures on the A. M. E. lateral was completed, and work was commenced on the erection of a section house at the head of the C. J. Lateral system. The tarring of all metal flumes on the lower section of the project was completed, and similar work was begun on the upper division of the project. Work was also begun on the necessary repairs to the Garnet Canal and East Canal river dams.—*L. J. Foster.*

BOISE PROJECT, IDAHO.

Farming operations.—Under favorable weather conditions the harvest of this year was about completed.

Clover hulling was still in progress, with good yields being reported. The last of the head lettuce crop was being harvested and shipped. Owing to a slump in the market, a number of the growers of late potatoes were storing the crop in hopes of receiving better returns before spring.

Operation and maintenance.—Water was delivered for irrigation until the 20th, when it was closed out of all canals, and as soon as the ground was in shape fall cleaning was commenced. Repairs were also under way on the lining of the main canal. The high water of this spring deposited an unusually large amount of silt in the upper section of the main canal and back of the Boise River diversion dam. Sluicing operations at these points were begun on the 21st, and were still under way at the close of the month.

Drainage.—One dragline excavator continued excavation on the Hellyer Drain. Field work was continued on the water-logged area below Deer Flat Reservoir. During the month a report was prepared with estimates for the construction of drains in the Wilder and Arena Basin areas.

Surveys.—Some field work was done on the Black Canyon division and borings were being made at the site of the proposed Black Canyon diversion dam. A few surveys were made in connection with the operation and maintenance of the Boise Project canal system. Estimates and plans are still being prepared for the Owyhee secondary project.—*J. B. Bond.*

KING HILL PROJECT, IDAHO.

Construction.—At Camp 11 the Slick flume, reinforced concrete, 7,510 feet long, was completed on the 23d, having been poured in 35 working days, or an average of 215 feet per day. Work was begun on Little Alkali siphon and Big Alkali trestle. Concrete inlet and outlet for Slick siphons Nos. 1 and 2 were poured and the excavation for siphon No. 1 practically completed. At King Hill the lock joint pipe plant was 60 per cent complete and 90 per cent of the materials were on hand at the end of the month. Sand and gravel for the pipe were washed, screened, and stored.

Operation and maintenance.—Water delivery was discontinued October 1. A force of 14 men and 12 horses began cleaning canals and repairing structures on the 7th. This work was completed to Station 460 at the end of the month.—*E. C. Panton.*

MINIDOKA PROJECT, IDAHO.

Water was shut out of the Main North Side Canal on the 11th and out of the Main South Side Canal on the 15th. The South Side pumping stations were shut down on the latter date. The water in Lake Walcott was drawn down below spillway crest, so as to permit minor repairs being made below the lower toe of the spillway. These repairs were completed, and the water in the lake raised to elevation 4243.80.

The usual post-season inspection and overhauling of the power and pumping systems was under way. On the pumping unit the work of cleaning canals and laterals was begun.

Deliveries of water to farm units for the season amounted to 96,731 acre-feet. In 1920 the amount delivered was 123,366 acre-feet. During the months of July and August, however, the deliveries were greater in 1921 than in 1920.

At American Falls four purchases of right of way were made for \$8,590, making the total expenditures

to date \$252,971.19 for this purpose. Rentals received during October for the property which has been purchased were about \$1,033, or at the rate of about 5 per cent per annum on the investment.

Minor surveys were made in connection with the new town site of American Falls and with the dam site. Topographic surveys of the North Side Pumping Division and of the Mountain Home project were continued.—*Barry Dibble.*

HUNTLEY PROJECT, MONTANA.

The Ruth dredger worked continuously, cleaning the main laterals.

Supplemental construction work was continued and a number of small checks and turnouts were replaced on the lateral system.

Drainage.—Open drain No. 18 was practically completed. A heavy flow of water was encountered between stations 28+00 and 36+00.

The dragline was moved from drain 18 to the Main Canal at Pompeys Pillar, which had become badly silted up for a distance of 2 miles below Lost Boy flume.

Visitors.—Morris Bien, assistant director, visited the project on the 21st and held a very interesting conference with the directors of the irrigation district.

Agricultural.—Harvesting of all crops was completed early without any delays. Siloed beets were being shipped as fast as cars were provided. The light crop of alfalfa hay forced the price on the project up to \$8 or \$10 in the stack, whereas in the surrounding country it was being sold for about \$5. Little feeding will be done on the project this winter, owing to the lack of both feed and stock.—*A. R. McGinness.*

MILK RIVER PROJECT, MONTANA.

Thrashing operations on the project were completed. The third cutting of alfalfa and some blue joint hay was in progress. The market for hay was slow, with very slight demand.

Surveys.—Farm unit and lateral extension surveys were continued in the vicinity of Glasgow and Hinsdale. Plane-table parties were engaged on topography of Beaver Creek Flats in the vicinity of Saco and Ashfield. A party was also started on making a topographic survey of the shore line of Nelson Reservoir between high and low water elevations. Some survey work was required in connection with construction contracts in force.

Construction by contract.—The contractor for Nelson Reservoir enlargement made good progress. Four new, small earthwork contracts were let, involving about 70,000 cubic yards of lateral excavation near Hinsdale, and work was begun on all of these.

Construction by government forces.—The concrete measuring device was about completed at the head of the Dodson North Canal. Other work consisted of placing farm turnouts, checks, weirs, etc., on various places throughout the project. A metal flume on lateral V-90-3 was begun. The P. and H. dragline completed work for the season on the ND-2 drain and was moved to the vicinity of Beaverton, where it was engaged in enlarging the Nelson Reservoir Canal.

Operation and maintenance.—The Dodson South Canal was operated from the 14th to the 24th for delivering stock water in the Bowdoin District. The Vandalia South Canal was operated from the 13th to end of month, for the purpose of giving the water users a fall irrigation. Maintenance work on the

Malta Division consisted of pouring 150 concrete blocks of about 1 cubic yard each, and the hauling and placing of 150 cubic yards of field boulders by contract, for use in repairs below apron at Dodson Dam. The Ruth ditch cleaner was operated from the 1st to 8th, one shift per day, and from the 10th to 31st, two shifts per day. This machine was cleaning the D. S.-50 Lateral. Considerable difficulty was encountered on the Vandalia Canal as the result of a strong wind on the 21st, which caused some extensive weed jams in the canal. There was, however, no damage caused by these jams.—*H. A. Parker.*

Prevailing crop prices at close of October, 1921.

Project.	Alfalfa hay, per ton.		Barley, per bushel.	Oats, per bushel.	Wheat, per bushel.	Potatoes, per bushel.
	In stack.	Baled at ship- ping point.				
Salt River.....	\$8-10	\$12-14	\$0.68	\$0.52	\$1.29	\$1.50
Yuma.....	10.50	13.00				
Orland.....	8.00	12.50	.55		.99	
Grand Valley.....	8.00	12.00		.50	.75	.90
Uncompahgre.....	5-10		.55	.34	.78	.60
Boise.....	4.00	8.00	.35	.45	.78	.90
King Hill.....	4.00			.42	1.25	.90
Minidoka.....	4.00	9.00	.38	.80	.66	
Huntley.....	8-10					
Milk River.....	6.00		.19	.42	.96	1.05
Sun River.....	5.00	9.00	.50	.45	.91	.90
Lower Yellowstone..	6.50	9.50	.30	.25	.95	.70
North Platte.....		7.00		.20	.90	.75
Newlands.....	6.00	10.00				1.20
Carlsbad.....		10-12.50		.75	.20	
Rio Grande.....	16.00					
North Dakota pumping.....	12.00		.26	.18	1.08	1.20
Umatilla.....	6.00	10.00				1.20
Klamath.....	5.00	10.00	.53	.37	.90	
Belle Fourche.....	6.00	10.00	.35	.32	.95	1.25
Strawberry Valley..	6.00	9.00	.50	.42	.60	.75
Okanogan.....	10.00					1.20
Yakima:						
Sunnyside.....	5.50	8-10				.84
Tieton.....	5.50	8-10				.84
Riverton.....	5.00		.40	.35	.70	.90
Shoshone.....	5.00	7.50		.26	.80	.72
Indian projects:						
Blackfoot.....	12.50		.48	.32	.80	
Flathead.....	9.00	15.00		.42	.73	.75
Fort Peck.....				.11	.97	1.00

ST. MARY STORAGE DIVISION.

The St. Mary Canal was not operated. Most of the water stored in Sherburne Lakes Reservoir during the summer was released. At the beginning of the month the storage amounted to 28,000 acre-feet, and at the end of the month 2,500 acre-feet.

On maintenance work a small crew was employed moving slide material from the canal section above the fifth drop. The Bucyrus dragline was used for a few days in raising and strengthening canal banks on the eleventh mile of the canal.—*R. M. Snell.*

SUN RIVER PROJECT, MONTANA.

Government forces completed the improvement of the operation highway along the Pishkun and Sun River Slope Canals. The earthwork of Lateral D extension, Fort Shaw Division, was completed under contract with J. B. Roberts & Son. Contract was

executed with Jenkins Bros. for the earthwork of lateral GM-46 and distributaries in Part 2 of Greenfields Division, and construction work was begun.

Twenty-five second-feet of water were run in the Fort Shaw system, and 16 deliveries were made for irrigation purposes.

Maintenance work on the Fort Shaw Division consisted of placing 15 weirs. On the north side system short sections of the Pishkun Canal were blanketed and dry paving was placed for bank protection; the outlet structure at Pishkun Reservoir was repaired and the railing on Arnold Coulee Drop was repainted; surface drains below culverts on the Pishkun and Sun River Slope Canals were cleaned; work was begun on the cut-off wall at station 154 of Greenfields Canal.

Farmers finished thrashing, baled and marketed hay, and harvested potatoes. Twenty-two cars of wheat, 10 of hay, 5 of potatoes, and 2 of household goods and machinery were shipped from the project.—*Geo. O. Sanford.*

LOWER YELLOWSTONE PROJECT, MONTANA.

The only crops remaining unharvested were a few small scattered fields of sugar beets and corn. The yield of sugar beets was much above expectations, some fields yielding as high as 18 tons per acre.

The Ruth ditch-cleaning machine completed the cleaning of laterals on District No. 1 and cleaned 2,600 linear feet of laterals in District No. 2. This machine cleaned 5.6 miles of ditches, bringing the total travel miles for the season to 27.3. Although better work can be done, and the unit cost is cheaper, with water in the laterals when this machine is working satisfactory progress was being made with the material either sticky or dry.

The small operating force on division No. 1 cleaned the silt from 225 linear feet of outlet end of Drain Wx, installed 5 concrete checks in laterals, and cleaned the silt left by the Ruth machine under 10 bridges and other structures.

On District No. 2 the organization installed five concrete checks and one concrete drop; removed silt and raised banks on laterals UU and UU-1 where the Ruth ditch cleaner could not work, and cut brush on laterals A and UU-1, and also a portion of that on lateral UU.

The construction of the extensions under contract 864 is 59 per cent completed.—*L. H. Mitchell.*

NORTH PLATTE PROJECT, NEBRASKA-WYOMING.

Operation and maintenance.—The valves in the south tunnel of Pathfinder Reservoir were closed on the 20th, the reservoirs at the lower end of the system on the Interstate Division being filled. At the end of the month the storage in the reservoir was 529,290 acre-feet.

About 800 second-feet were diverted into the Interstate Canal from the 1st to the 25th, for the purpose of filling the reservoirs at the lower end of the system. An average of 59 second-feet were diverted for power purposes. About 500 cubic yards of sand were sluiced from the sand trap at the headworks during the month. A total of 74 acre-feet was used on the Northport Division the first 5 days of the month, water being turned off on the 5th. A total of 3,983 acre-feet was used during the season, serving approximately 2,200 acres. From the 1st to the 5th a head of 50 second-feet was run in the Northport Canal for priming purposes.

On the Interstate Division dragline No. 122230 commenced work on the enlargement of the Interstate Canal, starting at Spring Canyon Flume, and it had widened the canal up to Mile 13.0 by the end of the month.

Crops.—The crop yield for the season was fair. The thrashing was practically completed. At the end of the month the sugar-beet harvest was 80 per cent and the corn harvest 25 per cent complete. The potato crop was the only one for which there was a steady market during the month. The price, however, dropped off somewhat from that of last month, being \$1.25 per hundredweight at the end of the month. Approximately 5,000 sheep and 500 cattle had been shipped in for winter feeding on the project.

Drainage.—Dragline No. 122229 continued work on the Lower Nine Mile Drain. A by-pass around the Minatare Drain Siphon site was excavated, and the waters of Lower Nine Mile were diverted through the by-pass, in order that the siphon site may dry out before excavation is started.

Dragline No. 121157 continued work on the excavation of the Dry Spottedtail Outlet Channel. After completing the construction of a small channel from the river to Chalupas house, the machine moved back to the river and engaged in the work of widening the channel.

Construction forces were engaged in the building of a temporary bridge over the by-pass, Minatare, and Lower Nine Mile Drains, and also in the manufacture of lock-joint pipe used in the construction of the Minatare Siphon.

A total of 240 acre-feet was discharged by the drainage pumps on Dutch Flats during the month.

On the Fort Laramie Division electric dragline No. 131313 completed the move to the Katzer drain and commenced digging on the 8th.

Construction.—Storage Division: At Pathfinder Dam the concrete piers for setting tunnel lining and emergency gates were completed, as were the conduits for the balanced valves in the North Tunnel Outlet. A part of the force was employed in preparing plant for handling valve castings. This was estimated to be about 95 per cent complete at the end of the month.

Fort Laramie Division: The three electric draglines working on the Fort Laramie Canal completed 1.56 miles of canal.

Drag line No. 121150 continued work on placing earth lining on the Fort Laramie Canal. After suspension of the above work, the machine started the excavation of the Grant Drain.

Work was completed on the new headworks of the Fort Laramie Canal. Water was turned through the new gates for the first time on the 24th.

Good progress was made on the construction of canal and lateral structures by Government forces. Work progressed in a satisfactory manner on the Upper Cherry Creek Valley structures. An excellent showing was made on the structures in the Second Lateral District. Contract work on the two East Springer lateral siphons progressed in an efficient manner. The majority of the earthwork and gravel hauling contracts were completed.

Northport Division: The excavation of the Northport Canal was continued by the electric dragline and the Bucyrus Class 14 machine. Good progress was made on the construction of lateral structures. The contractors on the construction of the siphons on Dug-out and Bratten Creeks made good progress, and at

the end of the month were working on the second structure.

Power system.—The Lingle Power Plant was operated three 8-hour shifts daily; 5,100 kilowatt hours were sold to the town of Lingle, Wyoming, 33,600 to Torrington, Wyoming, 10,600 to Morrill, Nebraska, and 31,400 to Mitchell, Nebraska.

Surveys.—Two parties were put in the field the latter part of the month on the location of the Table Mountain and Horse Creek Lateral Systems.

Settlement progress.—Good progress was made on the extension of the Union Pacific Railroad through the Fort Laramie Division. At the end of the month steel was being laid on the spur running through Cherry Creek Valley. The new town of Lyman, Nebraska, has taken on the appearance of a boom. Several modern buildings have been constructed and several others are in the process of erection. At the end of the month only two successful applicants had not made filing on the lands opened to entry last September.

The votes taken on Supplemental Construction on the Interstate Division were 855 for and 55 against. This action insures the construction of the Guernsey Reservoir.—*E. E. MacDonald.*

NEWLANDS PROJECT, NEVADA.

Practically all crops were harvested. Digging of a good crop of potatoes was completed. Aside from melons and vegetables, potatoes were practically the only profitable crop raised during the past season.

On the 26th a celebration was held at the local sugar factory, the occasion being the reopening of the factory after several years of inactivity. Gov. Emmett D. Boyle and others were in attendance and spoke.

Good progress was made during the month on construction of deep open drains. Two Class 14 Bucyrus dragline excavators, one P. and H. Class 208, and one Model 1 T. Monighan machine were in operation.

Truckee Canal improvement work was continued, using two dragline excavators and teams.

The replacing of the concrete lining in the Gilpin Spillway tunnel out of the Truckee Canal was continued, with good progress being made.

Water was shut out of the distribution system on the 15th, but on account of numerous requests for additional water in the Soda Lake district another short irrigation run will probably be made for that district.—*John F. Richardson.*

CARLSBAD PROJECT, NEW MEXICO.

All the maintenance force on the project was laid off, except the regular foreman and one man.

Cotton picking was in progress during the entire month. At the end of the month 3,025 bales had been ginned. The price paid for cotton picking remained at \$1.25 per hundred. Cotton was selling, for the various staple lengths, ranging from about 19 cents to 26½ cents, and grades were excellent, on account of favorable weather. It was estimated that the cotton crop was about 60 per cent ginned. The last cutting of alfalfa hay was harvested practically over the project. A small amount of water was being used for seeding winter grain. At the close of the month the foundation for the new cottonseed oil mill had been laid. Cotton seed was being held at the various gins pending the completion of the mill, which will probably be about January 1. The mill is located at Loving, N. Mex.—*L. E. Foster.*

RIO GRANDE PROJECT, NEW MEXICO—TEXAS.

The inflow into the Elephant Butte reservoir at San Marcial was steady but very light.

There was a nonirrigation period of 15 days during the month, but large heads of water were run through the canals in an effort to sluice the sand that had accumulated during the summer. A heavy harrow was dragged through the canals to dislodge the sand and all wasteways opened. In this way considerable sand was sluiced out of the Leasburg, Franklin, and Chamberino Canals.

On the 14th a heavy rain in the foothills washed out a section of the Rodey ditch near Hatch. Two hundred feet of brush riprap were placed in Wasteway No. 1 from the Leasburg Canal. The banks of the Mesilla, West Side, and Chamberino Canals were protected with brush riprap in places where the banks had eroded.

Crops generally were very good, considering the late frost in the spring. Some alfalfa growers were harvesting the fifth cutting. Cotton picking and sweet potato harvesting were in progress.

Five cans of fish—one each of channel cat, crappie or white perch, sunfish, yellow perch, and bass—were received from the Bureau of Fisheries and planted in the reservoir at Elephant Butte.

At Elephant Butte the concreting of the spillway channel was nearing completion. The plug was successfully removed from one of the lower balanced valves and the new plug was being prepared for lowering into place. In the Mesilla Valley two Bucyrus Class 9½ excavators and one Monighan 2-ton excavator continued drainage construction. A Ruth ditch cleaning machine and a P. and H. dragline proceeded on lateral construction and reconstruction. In the El Paso Valley two Bucyrus Class 9½ excavators and one contract machine continued on drainage construction. A Bucyrus 30-B dragline operated on canal reconstruction, and a P. and H. on lateral reconstruction. Good records were made by all machines during the month in both yardage output and cost, the output averaging over 1,000 yards per shift for the project on Government-operated machines on drainage construction.—*L. M. Lawson.*

NORTH DAKOTA PUMPING PROJECT.

The marketing of grain continued, and some outside buyers were coming in to negotiate for the potato crop.

Power-house operations fell off about 6 per cent from the same month of last year, owing partly to the general depression and partly to the destruction of the Williston Creamery by fire, the creamery having been one of the largest power consumers. The income, however, was about \$800 more than last year and the operations show a profit.

Nine hundred and thirty-five tons of coal were mined.—*Wm. S. Arthur.*

UMATILLA PROJECT, OREGON.

Farming operations.—The principal farming operation was the picking and packing of the apple crop. Little land development was in progress, and the hay crop was moving slowly, at a very low price. Seventy-one cars of baled and chopped alfalfa hay and 13 cars of apples were shipped during the month. Over 11 tons of honey were marketed.

Operation and maintenance.—At the close of the month there were 1,550 acre-feet of available storage in Cold Springs Reservoir. Little water was furnished for irrigation, the chief diversion being for construction purposes. From 9 to 40 second-feet,

from 15 to 25 second-feet, and from 27 to 51 second-feet were diverted by the A Canal, the Maxwell Canal, and the West Extension Main Canal, respectively.

Construction, East Side.—Concrete lining of the A Canal was continued with good progress. Delivery of gravel under contracts with O. O. Felthouse and M. L. Watson was completed on the 18th. At the close of the month delivery of sand by Government forces was practically completed. A short delay was occasioned by the failure of cement to arrive by the time it was required, but at the close of the month deliveries were well in advance of requirements. Good progress was made on enlargement.

A crew was employed excavating and concrete lining the old Cabbage Lateral.

A crew was employed on betterments to the D Lateral. Six hundred and thirty-six linear feet of 30-inch concrete pipe (old) were laid, and 36 cubic yards of concrete lining placed.—*Maurice D. Scroggs.*

KLAMATH PROJECT, OREGON—CALIFORNIA.

A large number of motor trucks were engaged in hauling grain from the Tule Lake country to Klamath Falls.

A small head of water was run practically all month in the G and D Canals for the live stock being pastured on the Tule Lake lands. Water was turned into the Lost River Diversion Canal on October 14.

One survey party was engaged on survey work in connection with the precast flume on the C Canal and on the structures on the C-G Canal. On October 15, field work was begun on the location of the lateral system for lands in the Tule Lake Division on the west side of Lost River.

In the Tule Lake Division three dragline excavators were engaged in the construction of the J Canal and on outlet ditches to Tule Lake.

On the C Canal the new precast concrete flume was erected for a distance of 1,536 feet, and the old timber flume was dismantled for about 1,800 feet. Work was also in progress on the special structures on the flume. The wasteway structure to the Diversion Canal was about 50 per cent complete; excavation for the foundation for the highway structure was begun on October 26.

On the C-G Canal the pipe lines on the north and south sides of Lost River were completed. The principal work remaining to be done consists of 153 feet of pipe 6 feet 3 inches in diameter across the river. Cofferdams were constructed and pumping machinery was installed to unwater the trench across the river.

On the protection work on the C Canal, between the headworks structure and the drop, the concrete lining was completed, also the bridge over the headgate structure.

On the Lower Diversion Dam on Lost River good progress was made by the contractor. The work on the north side of the river was practically completed. The water in the river was turned through the sluice gates on the 25th. Some work was done in placing concrete for the piers and the abutment on the south side of the river.

The California-Oregon Power Co. completed the construction of the Link River Dam on October 29. Good progress was made in the excavation of the channels directly above the dam and on the reef at the head of Link River.—*Herbert D. Newell.*

BELLE FOURCHE PROJECT, SOUTH DAKOTA.

The principal work done in connection with crops was the picking of corn, the harvesting of beets, and

the baling and hauling of hay. Some small grain was marketed and the potato harvest was completed. There was a limited demand for alfalfa hay and only the best grade could be sold for shipment. There was not enough stock in the country to consume half of the hay on the project, but if the extremely dry weather continues many of the farmers look for a demand for hay later in the season owing to the necessity of range stock coming in for water. During the month hog cholera was reported on four or five farms; in fact, a number of droves were practically annihilated. This project was declared a cholera district and will be treated in the same way as all other districts in the eastern part of the State. Project cattle were in good condition and a considerable number of sheep were being fed on the project.

Maintenance work was carried on from the three district headquarters. At the close of the month nearly all work planned for the fall was completed, and the system was in good shape for next season's run.

Progress of construction work on the Willow Creek lateral system was satisfactory. Practically all of the main lateral and a large portion of the principal sublaterals were completed.

Assistant Director Morris Bien arrived on the project on the 14th. Mr. Bien's visit was very much appreciated by project officials and others, and it is believed that a great deal of good was done by his conferences with the directors and other water users.—*B. E. Hayden.*

STRAWBERRY VALLEY PROJECT, UTAH.

Farming operations.—The harvesting of all crops on the project was practically completed, with the exception of the sugar beet and potato crops. Extensive feeding of cattle and sheep on project lands was taking place, as perfect weather conditions produced a considerable growth of alfalfa.

Hydrographic data.—The gates at East Portal of Strawberry Tunnel were shut down at noon on the 15th, and the irrigation season of 1921 brought to a close.

Operation and maintenance, storage works.—The usual patrol work was done, and general supervision given all structures comprising the storage works by the regular force at East Portal. Ventilating duct was installed in gate operating house at East Portal.

Operations at West Portal were continued. All preparatory work was accomplished and placing of concrete started at Station 130+00.

Operation and maintenance, power system.—Power was furnished the towns of Spanish Fork, Payson, Springville, and Salem.—*W. L. Whittemore.*

OKANOGAN PROJECT, WASHINGTON.

Repairs were made to Duck Lake Pumping Plant, where the building was burned in September, and other minor repairs to machinery, and the storage and caring for equipment hauled down from the Salmon Lake Dam construction. At the end of the month a small run of water was being made to fill cisterns, and no doubt it will be necessary to operate the Robinson Flat Pumping Plant for an irrigation of that part of the project early in November.

The project was visited by Assistant Director Morris Bien on October 26 and 27.—*Calvin Casteel.*

YAKIMA PROJECT, WASHINGTON.

Construction.—The work of piling logs and débris at the lower end of Lake Keechelus was closed down

at the end of the month, and equipment housed for the winter.

Operation and maintenance.—Sunnyside Division: The irrigation season closed on October 30. The diversion for the Sunnyside Canal was steadily reduced from a maximum of 716 to a minimum of 289 second-feet, the average for the month being 542 second-feet. At the Outlook pumping plant the large unit was closed down on the 15th, the small unit only being operated from that date until the 28th, when water delivery to the district terminated. At Snipes Mountain plant the large unit was operated until the 10th, the small unit being in operation from the 10th to the 29th. The Rocky Ford power plant and both motor-driven pumps at the Grandview pumping plant were closed down on the 17th. The hydraulic unit was operated until the 30th. The Prosser and Spring Creek pumping plants were closed down on the 17th, and dismantling of the units was started.

Tieton Division: Delivery of water was continued until October 15 to provide for filling of cisterns for winter use. An average diversion of about 125 second-feet was maintained during this period, of which only a very small amount was used for irrigation. Work was started on the fall program of cleaning laterals. Piling and burning of logs at Bumping Lake Reservoir were discontinued on the 15th. Practically all the logs around the north slope of the lake were piled and burned.

Visitors.—Assistant Director Morris Bien visited the project October 28 and 29, arriving in time to take part in the Washington Irrigation Institute annual meeting.—*J. L. Lytle.*

TIETON DAM.

During October considerable rainy weather occurred at Tieton dam, but not enough to hinder the progress of the work. The crew which consisted of 295 men was reduced 20 per cent. The tunnel excavation and intake structure were completed, and arrangements made for diverting power water at the lower end of the tunnel. Corewall excavation and concreting continued without interruption. The sand and gravel plant operated continuously, and the saw mill made a two weeks' run, cutting out about 250,000 feet b. m. of lumber for corewall and other uses. The freighting contractor completed the hauling of cement, coal, equipment and miscellaneous supplies. All necessary heavy freighting required before next spring was accomplished while the roads were good. The 100-ton electrical 2½-yard shovel was received, transported to the dam and assembled. A 10-ton cableway was erected over the centerline of the dam, and roadways graded preparatory to laying of tracks for transporting material next spring for the dam embankment.

The construction engineer returned from Milwaukee and Dayton, Ohio, where he inspected the electrical shovel and pumping equipment. Senator W. L. Jones visited the dam on the 1st and 85 guests of the Washington Irrigation Institute were entertained on the 29th. The Tieton River will be diverted on November 3, after which the principal work for the winter will be the excavation of the river section of corewall trench and backfilling it with concrete.—*F. T. Crowe.*

RIVERTON PROJECT, WYOMING.

Dragline No. 121322 was operated on the Wyoming Canal between Mile 7 and Mile 8.

Dragline No. 121323 worked three days building road for the Wyoming Canal along the side hill between Stations 0 and 13.

Dragline No. 121474 completed the gravel cut near Mile 6 on the 19th and moved to Mile 8, near which point it was working the remainder of the month.

Dragline No. 121323 was employed on the diversion dam after the 4th, excavating for the sluiceway, logway and weir, and moving gravel to the screening plant.

On the diversion dam the excavation for the sluiceway and logway was completed except for cut-off trenches. Additional excavation was done for the weir. The sluiceway was completed to the elevation of the gate sills, and some concrete placed in the logway. Forms for the logway and for the retaining wall below the sluice were nearly completed.

One survey party was employed on canal location working from Pavillion. This party made investigations of possible tunnel sites near Mile 10 of the Wyoming Canal and also began the investigations of the damsite for the proposed Pilot Butte reservoir.—*H. D. Comstock.*

Project weather during October, 1921.

Project.	Station.	Temperature, °F.			Precipitation (inches).
		Maximum.	Minimum.	Mean.	
Salt River.....	Phoenix, Ariz.....	100	44	73.8	0.11
Yuma.....	Yuma, Ariz.....	101	46	75.2	0.04
Orland.....	Orland, Calif.....	98	38	65.37	0.74
Grand Valley.....	Grand Junction, Colo.....	82	27	58	0.66
Uncompahgre.....	Montrose, Colo.....	80	23	53.5	0.66
Boise.....	Boise, Idaho.....	82	33	55.5	0.16
King Hill.....	Glens Ferry, Idaho.....	85	25	50.2	0.14
Minidoka.....	Burley, Idaho.....	87	21	53.9	0.23
Huntley.....	Ballantine, Mont.....	79	22	48.1	0.01
Milk River.....	Malta, Mont.....	76	21	48	0.15
St. Mary storage.....	Near Babb, Mont.....	83	18	53.3	0.11
Sun River.....	Fort Shaw, Mont.....	79	19	49	0.03
Lower Yellowstone.....	Savage, Mont.....	85	21	59.7	0.49
North Platte.....	Wyncote, Wyo.....	85	31	59.7	0.01
Newlands.....	Fallon, Nev.....	85	31	59.7	0.01
Carlsbad.....	Carlsbad, N. M.....	96	26	66.5	0.11
Rio Grande.....	El Paso, Tex.....	88	36	66.5	0.10
North Dakota pumping.....	Williston, N. Dak.....	77	25	48	0.10
Umatilla.....	Hermiston, Oreg.....	81	23	47.6	0.70
Klamath.....	Klamath Falls, Oreg.....	83	24	53.2	0.36
Belle Fourche.....	Orman, S. Dak.....	83	20	52.6	0.10
Strawberry Valley.....	Provo, Utah.....	86	24	53.4	1.55
Okanogan.....	Omak, Wash.....	83	25	52.1	0.57
Yakima.....	Sunnyside, Wash.....	85	27	53.5	0.17
Sunnyside.....	Cowiche, Wash.....	76	33	52.7	0.29
Tieton.....	Diversion Dam, Wyo.....	82	20	51.2	0.18
Riverton.....	Powell, Wyo.....	80	19	48.5	T.
Shoshone.....					
Indian projects:					
Blackfeet.....	Browning, Mont.....	68	10	42.6	0.12
Flathead.....	St. Ignatius, Mont.....	80	24	49	0.42
Fort Peck.....	Poplar, Mont.....	82	22	48.8	0.02

SHOSHONE PROJECT, WYOMING.

Operation and maintenance.—The principal work during the month was on the operation of the canal system. It was planned to shut out the water on the 15th, but owing to the unusually mild and dry weather it was necessary to continue running water until the 25th, to permit fall plowing and carrying alfalfa and winter wheat safely through the winter. Fourteen thousand three hundred and seventy-one acre-feet were diverted from the river, of which 6,800 acre-feet were delivered to the farmers for the irrigation of 11,000 acres. Ralston Reservoir was

drained October 25 to 30, to permit repairs to the Powell Water Works' intake.

Crops.—The farmers practically completed harvesting of crops and thrashing, and owing to the mild weather considerable fall plowing was being done. About one-half of the potato crop was marketed and the remainder stored for winter shipment. A number of the farmers were baling and shipping hay. The following shipments were made from the project during the month: Baled hay, 31 cars; wheat, 5; beets, 113; potatoes, 152, and stock hogs, 1.

Drainage excavation continued on the Garland and Frannie Divisions.

Construction.—Construction work on the Garland and Frannie Divisions was mostly in connection with drainage. At Shoshone Dam the principal work during the month was on the concreting of the power house and power tunnel. The latter work was completed, except for the transition sections from the concrete tunnel to the steel penstock. The powerhouse concrete work was carried well above the gallery-floor level. Five hundred and eleven cubic yards of concrete were placed in the power tunnel, and 448 cubic yards in the power house. An organization worked from Powell on the construction of the transmission line. Three and one-half miles of poles were set, but no wire was strung.—*J. D. Longwell.*

INDIAN PROJECTS, MONTANA.

BLACKFEET PROJECT.

The Two Medicine and Badger Fisher systems were operated most of the month for fall irrigation as a good many of the water users wished to get the ground in better condition in case of a possible water shortage next year.

At the end of the month all of the crops were harvested, all of the grain thrashed, and a considerable amount of it hauled to market. The crop yields were only fair and did not average as high as during the past two years under similar conditions of farming.—*R. M. Snell.*

FLATHEAD PROJECT.

Work under contract No. 858 was continued by the contractor, assisted by Government forces delivering material. One crew under Government forces was employed placing concrete lining and finishing canal section. Progress for the month was good, and, should the weather prove favorable, progress for November would bring this work up to the mark required for completion of the contract within the specified time. The work for the month was between Stations 199 and 250, and consisted of 4,855 linear feet of canal completed, and 69,203 square feet of concrete placed. The per cent completed was 40.8.

All crops were harvested, except an occasional third cutting of alfalfa, which has not been stacked.

Live-stock conditions were excellent.—*C. J. Moody.*

FORT PECK PROJECT.

On Poplar River Division the operation force was engaged in excavating additional grass spillways and making other repairs to B and C canals. The P. and H. dragline continued cleaning C canal, and at the end of the month but a few days work remained to complete the season's program.

On Big Muddy Division repairs to the paving below Homestead Dam were completed, and construction was resumed on minor structures. But little wheat is being marketed, owing to the lower price, and as a consequence business is dull.—*S. A. Kerr.*

GENERAL OFFICES.

Washington office.—Director Davis returned to the office on October 15 after spending three months in the field, visiting projects in the northwest and west central States, and making two visits to the Denver office. On most of the trip he was a member of the party of the Secretary of the Interior, who was examining the work of various bureaus of the department, particularly the Reclamation Service, the Indian Service, and the National Park Service.

Assistant Director Morris Bien left on October 1 for a western trip, expecting to return on December 1.

During the absence of the director and the assistant director the office was in charge of Chief Counsel Ottamar Hamele. On October 10 Mr. Hamele appeared before the Public Works Committee of the President's unemployment conference in Washington, and was questioned at length regarding the activities of the Reclamation Service and its ability to do construction work that would relieve unemployment during the coming winter, if funds were supplied.

Charles E. Harris, of the Transportation Section, Washington office, has been appointed representative of the Department of the Interior to serve on the Federal Traffic Board, performing duties dealing with the handling of passenger, express, parcel post, and freight shipments.

J. B. Beadle, director's assistant, returned to the office on October 31. Mr. Beadle has been attending a series of meetings throughout the West as a member of a committee appointed by the director to in-

vestigate present business methods of the Reclamation Service in order to see if its efficiency can be increased.

Corrected galley proof of the forthcoming annual report was returned to the printer on October 31.

Action was taken by the Secretary on the following matters submitted to him:

Reporting favorably on bill H. R. 8719, authorizing transfer of \$20,000,000 from the General Treasury to the Reclamation fund, to be repaid in annual installments of \$1,000,000 beginning five years from the date of the first advance, with interest at 4 per cent per annum; signed October 21.

Recommending that authority be granted to execute a contract with the State of California and the Klamath-Shasta Irrigation District, providing for the cooperative investigation of the feasibility of irrigating land in Shasta Valley, Calif.; approved October 22.

Recommending that authority be granted to execute a contract with the Pecos Valley Water Users' Association of Texas, providing for a preliminary investigation to determine the feasibility of the Red Bluff Reservoir site on Pecos River, New Mexico, as a location for a storage reservoir; approved October 24.

Recommending the execution of a contract with the Klamath Drainage District for the sale of water to district lands; approved October 25.

Recommending approval of the contract between the Carrick and Manghan Agua Fria Lands & Irri-

Comparison between operation and maintenance estimates and results, Jan. 1 to Oct. 31, 1921.

Project.	Gross cost.				Accruals.				Area which can be ir- rigated in 1921.
	Estimate for 1921.		Actual cost to Oct. 31.	Amount *over or under.	Estimate for 1921.		Actual returns to Oct. 31.	Amount more or *less than estimate.	
	Total for year.	To Oct. 31.			Total for year.	To Oct. 31.			
Belle Fourche.....	\$118,500	\$117,000	\$121,000	*\$4,000	\$148,000	\$148,000	\$148,000		<i>Acres.</i> 82,800
Boise.....	345,000	265,000	300,000	*\$35,000	321,500	318,000	330,000	\$12,000	165,800
Carlsbad.....	50,000	43,500	43,500		52,000	52,000	55,000	3,000	25,000
Grand Valley.....	60,000	46,000	49,300	*3,300	61,400	56,500	52,900	*3,600	38,350
Huntley.....	75,000	65,300	53,300	12,000	88,600	88,600	88,600		31,300
King Hill ¹	29,000				29,000				16,000
Klamath.....	75,000	62,900	61,400	1,500	87,900	87,900	86,300	*1,600	52,500
Lower Yellowstone.....	66,000	59,000	50,000	9,000	66,000	66,000	66,000		38,700
Milk River.....	90,000	74,000	74,000		45,000	45,000	14,700	*\$30,300	*74,500
Minidoka (south side).....	134,000	110,000	102,500	7,500	134,000	134,000	122,500	*11,500	49,000
Newlands ¹	118,700				120,600				69,300
North Dakota Pumping.....	59,050	54,300	42,000	12,300	26,800	26,800	26,800		7,650
North Platte:									
Interstate.....	275,000	245,000	251,000	*6,000	342,800	300,000	271,000	*29,000	*129,900
Fort Laramie.....	63,000	58,000	38,500	19,500	35,000	33,600	27,100	*6,500	14,000
Okanogan.....	35,000	31,500	40,000	*8,500	41,700	41,700	43,300	1,600	8,000
Orland.....	35,000	26,200	32,800	*6,600	41,200	41,200	41,200		20,500
Rio Grande.....	242,500	229,000	212,500	16,500	249,000	239,000	203,000	*\$36,000	118,000
Shoshone.....	108,600	101,000	81,000	20,000	126,000	126,000	120,000	*6,000	65,800
Strawberry Valley ⁴	30,000	22,000	23,600	*1,600	60,300	60,300	66,200	5,900	59,100
Sun River:									
Fort Shaw.....	20,000	18,800	16,900	1,900	26,400	26,400	25,600	*800	12,200
Greenfields.....	40,000	32,600	36,100	*3,500	15,000	15,000	21,000	6,000	25,100
Umatilla ¹	53,000				53,000				26,300
Uncompahgre.....	145,000	116,000	131,000	*15,000	152,300	152,300	152,300		100,000
Yakima:									
Sunnyside.....	135,000	112,500	110,000	2,500	150,500	150,500	150,500		110,800
Tieton.....	92,000	71,000	74,000	*3,000	103,200	111,000	105,500	*5,500	32,000
Yuma.....	233,000	200,000	238,000	*38,000	300,000	276,000	292,000	16,000	61,300
Total.....	2,727,350	2,160,600	2,182,400	*21,800	2,877,200	2,595,800	2,509,500	*\$86,300	1,433,900

¹ Report not received from project in time for publication.

² Stored water is furnished through St. Mary Canal for 21,600 acres additional.

³ Includes 17,000 acres, for which water is carried in main canal.

⁴ Does not include Strawberry tunnel repairs.

gation Co. and the Salt River Valley Water Users' Association for the purpose of providing a remedy for a rising water table affecting about 35,000 acres of land west of Phoenix, Ariz., by the installation of pumps, the company to pay the association for the water procured and advance \$600,000 for building a 5,000-kilowatt steam plant to develop electric energy for use on the pumps; approved October 26.

Recommending that authority be granted to execute a contract with the Baker County Chamber of Commerce for the advance of \$10,000 for preliminary work looking toward the construction of the Powder River project, Oreg.; the chamber of commerce to be reimbursed when an appropriation is made; approved October 28.

Among the visitors to the office during the month were Mr. Takayoshi Homma, chief hydraulic engineer of the Government General of Korea, who has visited a number of reclamation projects; Hon. Victor E. Keyes, attorney general for the State of Colorado; Gov. R. D. Carey and Public Land Commissioner Baker, of Wyoming; Messrs. D. C. Henny and C. E. Grunsky.

Denver office.—Chief Engineer Weymouth visited the King Hill project and made an examination of the Salt Lake Basin project. Assistant Chief Engineer R. F. Walter visited the Klamath project, the Shasta Valley project, and made an examination of the Lower Powder River (Baker) project. Assistant Chief Engineer C. P. Williams visited the Milk River project, the North Dakota Pumping project, and the Lower Yellowstone project. Visitors during the month included Director Davis; Assistant Director Bien; C. E. Drayer, national secretary of the A. A. E.; A. L. Fellows, of the Department of Agriculture; and State Engineers F. C. Emerson, of Wyoming, and A. J. McCune, of Colorado.

The principal work accomplished in the Designing Division during the month consisted of the preparation of drawings and specifications for reconstruction of Glenn's Ferry bridge and siphon, King Hill project; design of siphon spillway for C Canal headworks structure and preliminary designs for Horsefly Reservoir, Klamath project; detail designs for earthwork and minor structures, Lower Yellowstone project; designs for various buildings, Milk River project; designs for highway crossings over H and G Canals, Minidoka project; design for concrete siphon, Fort Laramie Main Canal, North Platte project; revised drawings of Wind River Diversion Dam, Riverton project; designs for miscellaneous structures, Sun River project; estimate and report for stock water-supply system, Uncompahgre project; drawings and preliminary estimates for outlet works Tieton Dam, Yakima project; advertisement for purchase of gates, etc., Yuma Auxiliary project; revision of preliminary estimates of various types of dam at Boulder Canyon, Colorado River Storage project; preliminary designs and estimates for Crooked River and Lower Willow Creek siphons, Deschutes project; preliminary design for Green River diversion dam, and tracing of project soil map, Green River project; and various designs and estimates of American Falls Dam, Snake River Storage project. Revised drawings and additional plans were prepared in connection with the experimental program at Elephant Butte Dam.

The principal work accomplished in the Electrical Division during the month consisted of inspection of outlets of Arrowrock Dam, Boise project, of the power site adjacent to the Orchard Mesa pumping plant, and also of the Price-Stubbs pumping plant,

Grand Valley project. A conference was held at American Falls and Rupert relative to the protest of the various towns against the application of the Idaho Power Co., Minidoka project. Consideration was given to the question of renewing the power contract with the town of Fallon, and an estimate made of the present cost of power at the Lahontan plant, Newlands project. Drawings were made of appurtenances of emergency valves at the North Tunnel Outlet, Pathfinder Dam, and specifications prepared for transmission line and substation at Yoder and Lyman, North Platte project. Work was continued on the designs of the various features of the Shoshone Power Plant, Shoshone project. Studies were made of plans of enlargement of the Yuma Valley drainage pumping plant, Yuma Auxiliary project. Estimates were made of transmission lines and power plants in connection with the Boulder Canyon Dam, Colorado River Storage project.

In the Legal Division a draft of proposed public notice for certain lands on the Milk River was considered. Form of letter to be sent to land purchasers on the Yuma Mesa who are delinquent in the second instalment was prepared. Recommendation was made for cancellation of water-right applications on the sandy area of the Okanogan project of those who have failed to sign option for purchase of their equities. Consideration was given to the serious condition presented where applications to make homestead entry as the result of the recent opening on the North Platte project have been held for rejection by the local land office owing to conflict with oil-prospecting permits. Considerable correspondence was had with lessees of land on secondary projects who are delinquent in payment of rental, and some correspondence was had with the State of Oregon relative to collection of money due from various irrigation districts on account of expenses incurred by the United States and the State for investigations under cooperative contracts.—Chas. P. Williams.

ARROWROCK AND SHOSHONE.

When C. H. Paul, former construction engineer of the Arrowrock Dam, Boise project, turned to page 501 of the November issue of the *RECORD* he promptly wrote us to this effect:

"I think I know my own dam when I see it. When was it moved to the Shoshone project?"

The answer is that in the rush of going to press we switched photographs and our titles got mixed. Change the word "Shoshone" to "Arrowrock," and we hope peace will be restored.

Accumulation of the smallest sums will in time provide for the purchase of a War Savings Stamp, which immediately begins working for you.

A Nebraska farmer, dissatisfied last fall with the 800-bushel return from 32 acres of wheat, at odd times during the winter ran the straw through the separator a second time. He obtained 75 bushels which sold for \$187.50. There had been a waste of 9.3 per cent of his crop. Careful thrashing pays.

ADMINISTRATIVE ORGANIZATION.

DEPARTMENT OF THE INTERIOR.

Hon. ALBERT B. FALL, Secretary of the Interior.
 EDWARD C. FINNEY, First Assistant Secretary.
 FRANCIS M. GOODWIN, Assistant Secretary.
 EDWIN S. BOOTH, Solicitor for the Interior Department.
 CHARLES V. SAFFORD, Administrative Assistant to the Secretary.
 CHARLES W. NESTLER, Administrative Assistant to the Secretary.
 HARRY G. CLUNN, Private Secretary to the Secretary.
 JOHN HARVEY, Chief Clerk and Superintendent of Buildings.

U. S. RECLAMATION SERVICE.

WASHINGTON, D. C.

Arthur Powell Davis, director; Morris Bien, assistant director; Ottamar Hamel, chief counsel; J. B. Beadle, director's assistant; C. J. Blanchard, statistician; Hugh A. Brown, editor and office assistant; C. A. Bissell, engineer; _____, chief accountant; Miss H. A. Fellows and Raymond Depue, fiscal agents; C. H. Fitch, chief clerk; Emmet Carr, purchasing agent; G. W. Numbers, appointment clerk; H. N. Bickel, Yakima, Wash.; W. A. Meyer, Denver, Colo., and W. F. Kubach, Great Falls, Mont., examiners of accounts.

DENVER, COLO.

F. E. Weymouth, chief engineer, Tramway Building, Denver, Colo.; R. F. Walter and C. P. Williams, assistant chief engineers; Miss L. H. Meisel, secretary to the chief engineer; J. M. Gaylord, electrical engineer; J. L. Savage, designing engineer; James Munn, engineer; J. L. Burkholder, drainage engineer; W. L. Drager, office engineer; J. M. Luney, chief clerk; A. McD. Brooks, purchasing agent; Harry Caden, special fiscal agent.

FIELD LEGAL OFFICES.

Boise, Idaho.—B. E. Stoutemyer, district counsel. Projects: Boise, Minidoka, King Hill, and Jackson Lake enlargement; R. M. Patrick, district counsel, located at American Falls, Idaho.

Denver, Colo.—Law section office of chief engineer: E. E. Roddels and Armand Offutt, district counsel; J. J. Buck, assistant district counsel.

El Paso, Tex.—P. W. Dent, district counsel. Projects: Rio Grande, Carlsbad, and Hondo.

Las Cruces, N. Mex.—Mark B. Thompson, attorney in charge of litigation on Rio Grande and Carlsbad projects.

Helena, Mont.—W. J. Egleston, district counsel, Helena, Mont. Projects: Blackfeet, Flathead, Fort Peck, Huntley, Milk River, St. Mary Storage, Sun River, North Dakota Pumping, Lower Yellowstone, and Shoshone.

Mitchell, Nebr.—J. N. Beardslee, district counsel. Projects: North Platte and Belle Fourche.

Montrose, Colo.—J. R. Alexander, district counsel. Projects: Grand Valley, Uncompahgre, and Strawberry Valley.

Portland, Oreg.—H. L. Holgate and D. G. Tyree, district counsel. Projects: Yakima, Okanogan, Umatilla, and Newlands.

San Francisco, Calif.—Henry A. Cox and A. B. Fullerton, district counsel, 349 Pacific Building. Projects: Salt River, Yuma, Orland, and Newlands.

PROJECT ORGANIZATION.

Belle Fourche Project.—B. E. Hayden, project manager, Newell, S. Dak.; R. C. Walber, chief clerk; August Lewin, fiscal agent.

Boise Project.—J. B. Bond, project manager, Boise, Idaho; E. R. Mills, chief clerk; C. F. Weinkauff, fiscal agent.

Carlsbad Project.—L. E. Foster, project manager, Carlsbad, N. Mex.; V. L. Minter, chief clerk and fiscal agent.

Grand Valley Project.—S. O. Harper, project manager, Grand Junction, Colo.; G. H. Murphy, chief clerk; A. H. Hall, fiscal agent.

Huntley Project.—A. R. McGinness, project manager, Ballantine, Mont.; G. H. Bolt, chief clerk; Miss M. C. Simek, fiscal agent.

King Hill Project.—Walter Ward, project manager, King Hill, Idaho; T. W. Hause, chief clerk; L. D. Eakin, fiscal agent.

Klamath Project.—H. D. Newell, project manager, Klamath Falls, Oreg.; N. G. Wheeler, chief clerk; G. R. Barnhart, fiscal agent.

Lower Yellowstone Project.—L. H. Mitchell, project manager, Savage, Mont.; C. A. Denman, chief clerk.

Milk River Project.—G. E. Stratton, project manager, Malta, Mont.; H. A. Parker, engineer; E. E. Chabot, chief clerk; G. S. Moore, fiscal agent.

Minidoka Project.—Barry Dibble, project manager, Burley, Idaho; Dana Templin, engineer; E. C. Diehl, chief clerk; Miss A. J. Larson, fiscal agent; F. A. Banks, engineer, American Falls, Idaho.

Newlands Project.—J. F. Richardson, project manager, Fallon, Nev.; A. W. Walker, engineer; G. B. Snow, chief clerk and fiscal agent.

North Dakota Pumping Project.—W. S. Arthur, project manager and chief clerk, Williston, N. Dak.; H. C. Melaas, fiscal agent.

North Platte Project.—Andrew Weiss, project manager, Mitchell, Nebr.; H. W. Bashore, engineer, Fort Laramie Division; Paul Rothl, irrigation manager; J. R. Ummel, chief clerk; Miss A. L. Perrine, fiscal agent.

Okanogan Project.—Calvin Casteel, project manager, Okanogan, Wash.; W. D. Funk, chief clerk and fiscal agent.

Orland Project.—R. C. E. Weber, project manager, Orland, Calif.; E. T. Eriksen, engineer; C. H. Lillingston, chief clerk and fiscal agent.

Rio Grand Project.—L. M. Lawson, project manager, El Paso, Tex.; T. W. Parry, irrigation manager; C. A. Peavey, chief clerk; L. S. Kennicott, fiscal agent.

Riverton Project.—H. D. Comstock, project manager, Riverton, Wyo.; R. M. Conner, engineer; G. H. Baird, chief clerk; J. C. Thraillkill, fiscal agent.

St. Mary Storage Division.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk; H. E. Bruce, fiscal agent.

Salt River Project.—Being operated by the Salt River Valley Water Users' Association; C. C. Cragin, general superintendent and chief engineer, Phoenix, Ariz.

Shoshone Project.—J. S. Longwell, project manager, Powell, Wyo.; J. R. Iakisch, engineer; C. M. Jump, superintendent of irrigation; W. F. Sha, chief clerk; Miss L. C. Drinkwalter, fiscal agent.

Strawberry Valley Project.—W. L. Whittemore, project manager, Provo, Utah; J. E. Overlade, chief clerk and fiscal agent.

Sun River Project.—G. O. Sanford, project manager, Great Falls, Mont.; H. W. Johnson, chief clerk; Miss M. G. Valentine, fiscal agent; G. A. Benjamin, irrigation manager, Fairfield, Mont.

Umatilla Project.—H. M. Schilling, project manager, Hermiston, Oreg.; M. D. Scroggs, superintendent of irrigation; G. C. Patterson, chief clerk and fiscal agent.

Uncompahgre Project.—L. J. Foster, project manager, Montrose, Colo.; A. H. Peach, chief clerk and fiscal agent.

Yakima Project.—J. L. Lytel, project manager, Yakima, Wash.; R. K. Cunningham, chief clerk; J. C. Gawler, fiscal agent; J. G. Heinz, engineer, Sunnyside, Wash.; J. S. Moore, superintendent of irrigation, Naches, Wash.; F. T. Crowe, engineer in charge construction Tieton Dam, Rimrock, Wash.; C. E. Crownover and C. F. Gleason, engineers; V. G. Evans, chief clerk; C. B. Funk, fiscal agent.

Yuma Project.—P. J. Preston, project manager, Yuma, Ariz.; R. M. Priest, superintendent of construction; S. A. McWilliams, engineer, Yuma Mesa Division; E. R. Scheppelman, chief clerk; E. M. Philebaum, fiscal agent.

INDIAN PROJECTS.

Blackfeet Project.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk and fiscal agent.

Flathead Project.—C. J. Moody, project manager, St. Ignatius, Mont.; J. M. Swan, chief clerk; J. P. Siebeneicher, fiscal agent.

Fort Peck Project.—S. A. Kerr, project manager, Poplar, Mont.; Henry Berryhill, chief clerk and fiscal agent.



Lower Yellowstone project at the State Fair, Helena, Mont. O. M. Oppgaard, one of the commissioners of Irrigation District No. 1, took an active part in collecting exhibits and arranging the booth for Richland County.

INDEX.

RECLAMATION RECORD, VOLUME XII.

FOR THE YEAR 1921.

Page numbers for separate issues.

No.	Month.	Page.	No.	Month.	Page.
1.	January.....	1-48	7.	July.....	297-352
2.	February.....	49-96	8.	August.....	353-400
3.	March.....	97-144	9.	September.....	401-448
4.	April.....	145-200	10.	October.....	449-496
5.	May.....	201-248	11.	November.....	497-544
6.	June.....	249-296	12.	December.....	545-584

A.

Accomplishments, summary of, by the Reclamation Service.....	278
Accruals, operation and maintenance costs and....	168
Act, Nevada irrigation district, held constitutional.	330
Advice, timely, from agricultural expert.....	560
African, South, engineer to be assigned to Reclamation Service.....	119
Alberta, Canada, irrigation plan for central.....	380
Alfalfa and live stock on the southwestern projects..	51
marketing, from southwestern projects.....	412
pest, kill, with poisoned bran.....	219
weevil, spraying saves alfalfa from.....	59
Alkali action on concrete, progress in investigation of.....	224
Anderson-Cottonwood Irrigation District, Torney et al. v.....	571
Animals, farm, diseases of.....	11
Annual report, fiscal year 1920.....	29
Antero & Lost Park Reservoir Co. v. Lowe.....	329
Apples, wrapping in oiled paper cuts down scald loss	60
Applicants, Federal irrigation water for delinquent.	271
Appropriation act, special provisions of the, for the Department of Agriculture.....	174
of water in Utah.....	329
Appropriations for Reclamation Service.....	176
April weather in the Western States.....	260
Argentine, courtesies appreciated by engineer from.	23
Arrowrock and Shoshone.....	582
Asia Minor, irrigation enterprises in.....	30
Assessments by water users' association must follow State law.....	570
Attorneys, former, of the Reclamation Service....	26
August weather in the Western States.....	480

B.

Barbour, A. R., Irrigation has helped materially to produce these results.....	251
Basin Mining Co., Wall v.....	570
Bebb, E. C., Progress in investigation of alkali action on concrete.....	224
Beets, sugar.....	507
Belle Fourche project crop report, 1920.....	194
Bennett, John E., v. United States.....	24
Bergin, Frank J., admitted to the bar.....	128
annual water charges on Federal irrigation projects, season of 1921.....	230
Berries of all kinds give quick returns.....	316
Bessemer Irrigating Ditch Co., Middlekamp v.....	427
Bigby v. United States.....	517
Bills, congressional, of interest to our readers.	470
introduced in Congress..... 26, 127, 221, 272, 330,	375
relating to Federal reclamation.....	571
Birds, raising game, on the farm.....	416
Bissell, C. A., Progress in national land reclamation in the United States.....	572
Blackfeet and St. Mary storage project office and employees.....	448
Blackleg threatens young cattle.....	161
Black, Russel V., Planning a new town.....	318
Blanchard, C. J., Current comments..... 6, 55,	103, 147, 206, 253, 304, 358, 405, 454, 500, 550
North Platte project land office.....	451
The Flathead project.....	557
Boardman community school, Umatilla project, Oregon.....	10
Bode v. Rollwitz et al.....	468
Boise project crop report, 1920.....	132, 133

	Page.		Page.
Boise project, Reclamation Service contract on, interpreted by court.....	468	Clemson Agricultural College, Hopkins v.....	427
project suit settled.....	425	Coal gas and water gas tar paints.....	21
Bond et al., New York Canal Co. (Ltd.) v.....	468	Coffin, E. H., Easy method of determining discharge over weir having velocity of approach.....	276
Bond et al., Payette-Boise Water Users' Association (Ltd.) v.....	173	Cole et al., Payette-Boise Water Users' Association, Ltd. v.....	425
Bonner, F. E., Sierra Ancha development.....	371	Colonization, irrigation and.....	478
Book reviews: Flow of water in concrete pipe.....	78	Colorado River, Congress consents to agreement between States respecting waters of.....	469
progress in national land reclamation in the United States.....	572	Compensation, additional, for Government employees.....	175
Booth, Edwin S.....	426	Compost heap, make a.....	63
Bothwell v. the United States.....	221	Concrete pipe, flow of water in.....	78
Bouquets.....	28, 54, 58, 65	Congratulations to Secretary Fall.....	327
Brady v. McGonagle.....	329	Conkling, Harold, Investigation of an irrigation project.....	324
Bramlette v. Louisville & N. R. R. Co.....	427	Connelly, Harold, 1901-1921.....	350
Brazil, reclamation project in northeastern.....	73	Construction reports.....	32,
reclamation project in the State of Rio de Janeiro.....	278	81, 129, 185, 231, 281, 334, 382, 432, 481, 529, 573	
British South Africa, irrigation in.....	30	Conveyance losses of water on U. S. Reclamation Service irrigation projects.....	180
Brook, H. H., Water charges, Rio Grande project....	170	Corn aids dairy cow ration.....	62
Budget, Bureau of the.....	430, 479, 524, 572	Cost and accruals, operation and maintenance....	168
Bulletins for the farmer.....	31,	Cow, dried apple pomace succulent feed for dairy..	459
80, 113, 154, 205, 278, 303, 381, 410, 542, 569		Crayons, use of, for tinting charts and diagrams....	71
Bulls, good, raise butter fat average.....	563	Crews, Mrs. Margaret, A penny for your thoughts..	158
Bureau of the Budget.....	430, 479, 524, 572	Crop reports, 1920:	
Butte County fair, South Dakota.....	547	Belle Fourche project.....	194
C.		Boise project.....	132, 133
Campbell, James A., 1879-1921.....	246	Carlsbad project.....	192
Canada, irrigation in.....	31	Grand Valley project.....	83
Cardiff Irrigation District, Gray v.....	375	Huntley project.....	337
Cardiff Irrigation District, People v.....	375	King Hill project.....	188
Carey Act amended.....	126	Klamath project.....	89
Act lien applicable only to lands with sufficient water supply.....	24	Lower Yellowstone project.....	134, 135
Carlsbad project crop report, 1920.....	192	Milk River project.....	386, 387
project, irrigation has helped materially to produce these results.....	251	Minidoka project.....	234, 235
project office and employees.....	50	Newlands project.....	38
Cattle, blackleg threatens young.....	161	North Dakota Pumping.....	40
buying, for winter fattening.....	362	North Platte project, Fort Laramie Division....	286
destroying lice on dairy.....	362	Interstate Division.....	286
Cenotaph, the unveiling of the.....	16	Okanogan project.....	91
Census of irrigation, the.....	523	Orland project.....	34
Charges, annual water, on Federal irrigation projects, season of 1921.....	230	Rio Grande project.....	288
Chart, Government of the United States.....	544	Salt River project.....	82
Chicks, care of baby.....	162	Shoshone project, Frannie Division.....	347
keep young, growing.....	219	Garland Division.....	347
Chief counsel, law notes.....	24,	Strawberry Valley project.....	242
75, 126, 173, 221, 269, 328, 374, 425, 468, 515, 570		Sun River project, Fort Shaw Division.....	436
Chile, bond issue for irrigation works in.....	278	Greenfields Division, Part 1.....	437
China, irrigation project at Foochow.....	278	Umatilla project.....	41
Chinese engineer to visit our works.....	142	Uncompahgre project.....	187
Choker, self-releasing, used in clearing reservoir sites, Yakima project.....	29	Yakima project, Sunnyside Division.....	344
City of Riverside, City of San Bernardino v.....	469	Tieton Division.....	345
of San Bernardino v. City of Riverside.....	469	Yuma.....	232
		Crops, they grow 'em in Montana.....	449
		Crowe, F. T., Tieton Dam, Yakima project, Wash..	475

Crownover, C. E., Self-releasing choker used in clearing reservoir sites, Yakima project.....	Page. 29	Engineering investigations—Continued.	Page.
Culiacan Valley, Mexico, canal to irrigate.....	380	Drought conditions in Sacramento Valley, Calif., probable recurrence of extreme.....	274
Current comments.....	6, 55, 103, 147, 206, 253, 304, 358, 405, 454, 500, 550	Fluorescein an aid to tracing waters underground:.....	122
D.		Maps and drawings, reproduction of.....	71
Dairy-cow ration, corn aids.....	62	Stations, rating, for large irrigation systems...	320
Dairy farmers, silo solves winter-feed problem for..	355	Water gas and coal gas tar paints.....	21
Dairying brings steady income to reclamation farmers.....	204	Wood-stave pipe on projects of the Reclamation Service.....	567
offers steady income to reclamation farmers....	508	Engineers and draftsmen wanted.....	228
Dairy show, the National.....	507	Entrymen, rights of, under the reclamation law...	374
Damages for delay by Government of inspection of material.....	24	Eriksen, E. T., Probable recurrence of extreme drought conditions in Sacramento Valley, Calif..	274
on account of seepage from canal.....	427	Europe, diary of a western boy in.....	19, 70
Data, filing personal engineering.....	522	Excavating machine operation.....	526
Davis et al., Twin Falls Salmon River Land & Water Co. v.....	24	Excavators, results of operation of dragline.....	326
December weather.....	79	Ex-service men, land patents to incapacitated....	469
Diary of a western boy in Europe. 19, 70, 118, 159, 217, 265		men, relief of.....	375
Dibble, Barry, Jackson Lake Reservoir.....	423	F.	
Discharge, easy method of determining, over weir having velocity of approach.....	276	Fall, Hon. Albert B., Secretary of the Interior....	146
District Counsel tries air route.....	398	Secretary, appraises Reclamation Service.....	451
Dodder is serious pest if remedies are delayed.....	110	Secretary, congratulations to.....	327
Dragline excavators, results of operation of.....	326	Farm animals, diseases of.....	11
Drawings and maps, reproduction of.....	71	Farmers' Irrigation District, Hooker v.....	427
Drought, probable recurrence of extreme, conditions in Sacramento Valley.....	274	Farmers, reclamation, dairying brings steady income to.....	204
Dryden v. Peru Bottom Drainage District.....	427	Farm inventory, good time to make.....	15
Ducks keep lateral clean.....	13	miniature.....	499
E.		name, limits on registration of, as trade-mark..	561
Eachus v. Los Angeles.....	571	February weather in the Western States.....	184
Easterday, A. M., Development in the North Platte Valley, Nebraska-Wyoming.....	403	Federal irrigation projects, annual water charges on, season of 1921.....	230
Economy.....	428	irrigation water for delinquent applicants....	271
and efficiency.....	453	motor cycles, State license tags for.....	517
pointers.....	380	reclamation approved.....	569
Efficiency, economy and.....	453	Water Power Commission's jurisdiction relative to irrigation.....	24
Egg, marketing a better.....	464	Filing system for the farmer and engineer.....	331
Eggs, remove hazards from hatching.....	62	Final proof by ex-service entrymen.....	175
Elephant Butte dam saves millions.....	260	Finney, Hon. Edward C., "Get acquainted" write-ups.....	268
Dam, spillway construction.....	223	Fish culture in connection with the irrigation projects.....	376
Reservoir, storage at, Rio Grande project.....	372	Flathead project, the, one of Montana's most beautiful valleys.....	557
The valleys of.....	418	Fleischer, McLaren v.....	374
El Paso—Project town and metropolis of the real Southwest.....	332	Flood, Uncompahgre River, June, 1921.....	473
Emancipation.....	250	waters, right of landowner to protect his property from.....	330
Employees, Rio Grande project office.....	280, 296	Flower buds, forcing, in the house.....	68
Engineering investigations:		Flow of water in concrete pipe.....	78
Alkali action on concrete, progress in investigation of.....	224	Flume scrubber.....	58
Conveyance losses of water on U. S. Reclamation Service irrigation projects.....	180	Fluorescein an aid to tracing waters underground..	122
Crayons, use of, for tinting charts and diagrams.	71	Fly, Col. Ben Franklin, The Yuma Mesa Division of the Yuma project, Ariz.....	319

	Page.	Hints from practical farmers—Continued.	Page.
Foreclosure of Government lien for water charges..	270	Bulls, good, raise butter fat average.....	563
Fort Shaw Division, Sun River project, Mont., crop report, 1920.....	436	Cattle, buying, for winter fattening.....	362
Foster, L. E., Irrigation has helped materially to produce these results.....	251	Cattle, destroying lice on dairy.....	362
Foster, L. J., Uncompahgre River flood, June, 1921.	473	Chicks, keep young, growing.....	219
Fowler, Benjamin A., 1843-1921.....	267	Compost heap, make a.....	63
Funds available for reclamation.....	546	Corn aids dairy cow ration.....	62
Full measure for full price.....	117	Cow, dried apple pomace succulent feed for dairy.....	459
G.		Dairy, how to fail in a.....	219
Gates, Mrs. Susa Young, Selecting and cooking pieplant.....	313	Dairy show, the national.....	507
Gaylord, J. M., Regulating outlet valves for storage reservoirs.....	421	Dodder is serious pest if remedies are delayed..	110
"Get acquainted" write-ups..... 211, 268, 368, 428,	467	Eggs, remove hazards from hatching.....	62
Gibbons v. United States.....	517	Farm inventory, good time to make.....	15
Girls, business, study budgets.....	20	Farm name, limits on registration of, as trade- mark.....	561
Goodenough et al., Horton et al. v.....	330	Grasshoppers, poison.....	259
Goodwin, Francis M., "Get acquainted" write-ups..	467	Hog cholera, fighting, with precautionary measures.....	413
Gophers, pocket, in irrigation projects, kill.....	218	Hog raising, preventing costly diseases in.....	111
Government automobiles, damages from.....	517	Hogs, delay in treating, exposed to cholera is costly.....	363
Grand River, change in name of.....	428	Lambs, management of fattening.....	153
Valley project crop report, 1920.....	83	Live stock on new irrigated farms.....	61
Valley project office and force.....	48	Measurements of produce.....	110
Grasshoppers, poison.....	259	Milk check, what part of the farmer's, represents profit.....	14
Gray v. Cardiff Irrigation District.....	375	Pigs, opportunities in growing feeder.....	562
Green Bay Co., Pumpelly v.....	427	Pork products, methods of preparing, on the farm.....	562
Greenfields Division, Part 1, Sun River project, Montana, crop report, 1920.....	437	Potatoes, irrigation of.....	60
Green, William M., Results of irrigation on the Huntley project.....	101	Potato, new light on development of tubers in the.....	459
Griffiths, Payette-Boise Water Users' Association v..	570	Poultry farmers, suggestions for..... 309, 362, 411, 458, 506, 559	258,
Gullickson, A. H., "Get acquainted" write-ups...	428	Rat-poisoning campaigns, variety means success in.....	153
H.		Silo, homemade.....	507
Hamele, Ottamar, Law notes..... 24, 75, 126, 173, 221, 269, 328, 374, 425, 468, 515, 570		Sows, keep brood, in winter as cheaply as pos- sible.....	14
Harden Herbert C., v. John Barton Payne, Secretary	375	Sugar-beet production and live-stock raising..	310
Hart v. United States.....	517	Sunflowers a good silage crop in some localities..	259
Harvey, John, appointed chief clerk of Interior Department.....	73	Sunflowers for feed in the Southwest.....	561
Hay growers, Oregon cooperative.....	470	Turkeys, feeding young.....	310
Making \$4, look like \$25.....	363	Turkeys spread gapeworms.....	259
Hendrich v. Walker River Irrigation District.....	330	Weeds, chemical spray to kill.....	413
Hillery, John, accidentally killed.....	446	Worms, new method to control, in pigs.....	563
Hinds, Julian, Use of crayons for tinting charts and diagrams.....	71	Hog cholera, fighting, with precautionary measures. raising, preventing costly disease in.....	413
Water gas and coal gas tar paints.....	21	Hogs, delay in treating, exposed to cholera is costly.	363
Hints from practical farmers:		Hogue, C. C., retires from Government service....	13
Advice, timely, from agricultural expert.....	560	Holgate, Harry L.....	127
Alfalfa, marketing, from southwestern projects.	412	Homes on the Lower Yellowstone project.....	200
Alfalfa pest, kill, with poisoned bran.....	219	Hooker v. Farmers' Irrigation District.....	427
Alfalfa weevil, spraying saves alfalfa from.....	59	Hopkins v. Clemson Agricultural College.....	427
Apples, wrapping, in oiled paper cuts down scald loss.....	60	Horseshoe Reservoir, litigation affecting the, site in Arizona.....	329
Beets, sugar.....	507	Horton et al. v. Goodenough et al.....	330
		Hunting sans firearms.....	74

	Page.		Page.
Hunt, L. A., Oregon cooperative hay growers.....	470	Lands, entry of, within Federal irrigation projects..	570
Huntley project crop report, 1920.....	337	exchange of, on North Platte project.....	427
Project, results of irrigation.....	101	the cause of hard.....	520
Hunt, N. B., filing personal engineering data.....	522	Lane et al. v. United States.....	570
Hunting sans firearms.....	74	Secretary of the Interior, United States ex rel.	
Hydraulic and excavation tables, new edition.....	480	McCullough et al. v.....	328
Hydrographer wanted.....	128	Larsen, Wm. C., Minidoka, the electric project....	367
I.		Law, departmental construction of land, upheld by	
Ice supply on the farm.....	66	Supreme Court.....	374
Idaho, reclamation in.....	31	Law notes:	
Idle lands, getting settlers for.....	556	Appropriation act, special provisions of the,	
Inspection of material, damages for delay by		for the Department of Agriculture.....	174
Government of.....	24	Appropriations for Reclamation Service.....	176
International Joint Commission interprets treaty		Assessments by water users' association must	
affecting Milk River irrigation project.....	515	follow State law.....	570
Investigation of an irrigation project.....	324	Attorney loses suit against Reclamation Service..	24
Irrigation and colonization.....	478	Bergin, Frank J., admitted to the bar.....	128
development.....	52	Bills introduced in Congress.....	26, 127, 221, 272
district, effect of judgment confirming, pro-		Bills relating to Federal reclamation.....	571
ceedings.....	329	Booth, Edwin S.....	426
districts, enlargement of, in California.....	375	Bothwell v. The United States.....	221
districts, powers of, and of taxpayers within		Carey Act amended.....	126
them.....	328	Carey Act lien applicable only to lands with suf-	
districts, right to attack validity of enlarge-		ficient water supply.....	24
ment of.....	375	Change in name of Grand River.....	428
Irrigation has helped materially to produce these		Compensation, additional, for Government em-	
results.....	203, 251, 302, 355	ployees.....	175
of potatoes.....	60	Congress consents to agreement between States	
results of.....	101	respecting waters of Colorado River.....	469
statistics, Fourteenth Census.....	27, 80, 125, 229	Congressional bills of interest to our readers..	375, 470
what is excessive.....	518	Damages for delay by Government of inspection	
J.		of material.....	24
Jackson Lake Reservoir.....	423	Damages from Government automobiles.....	517
Janecek, John, Omaha & N. P. Ry. Co. v.....	427	Damages on account of seepage from canal.....	427
January weather in the Western States.....	128	Departmental construction of land law upheld	
Jaynes v. Omaha Street Railway Co.....	427	by Supreme Court.....	374
June weather in the Western States.....	381	Distinction as to rights in a well and the pump	
July weather in the Western States.....	431	connected therewith.....	24
K.		Enlargement of irrigation districts in California..	375
Kerr, Frank M., a successful water user.....	220	Exchange of lands on North Platte project....	427
King Hill crop report, 1920.....	188	Federal irrigation water for delinquent appli-	
project office and employees.....	469	cants.....	271
Klamath County fair, live stock at the.....	548	Federal Water Power Commission's jurisdiction	
Irrigation District indorses work of Reclama-		relative to irrigation.....	24
tion Service.....	74	Final proof by ex-service entrymen.....	175
project crop report, 1920.....	89	Foreclosure of Government lien for water	
project office and employees.....	298	charges.....	270
project, Oregon-California, irrigation has helped		Former attorneys of the Reclamation Service..	26
materially to produce these results.....	355	Holgate, Harry L.....	127
L.		International Joint Commission interprets	
Lambs, management of fattening.....	153	treaty affecting Milk River irrigation project..	515
Land openings on the North Platte and Shoshone		Judgment, effect of, confirming irrigation dis-	
projects.....	410	trict proceedings.....	329
		Land patents to incapacitated ex-service men..	469
		Lands, discretion of Secretary relative to public	328
		Lands, entry of, within Federal irrigation	
		projects.....	570
		Limitations on Government leases.....	570

Law notes—Continued.

Litigation affecting the Horseshoe Reservoir site in Arizona.....	329
Litigation affecting the Reclamation Service.....	76
Members of water users' association not personally liable for assessments.....	570
Moneys, application of, collected for drainage on the Boise project.....	221
Nevada irrigation district act held constitutional.....	330
Obstruction of stream, right of action for, accrues at date of injury.....	126
Offutt, Armand.....	25
Oil leasing act, lands subject to the.....	174
Oil leasing act, the.....	25
Operation and maintenance deficits prior to 1914 held collectible.....	75
Owners, care required of ditch.....	328
Patent, form of, under act of May 20, 1920....	126
Payette-Boise Water Users' Association (Ltd.) v. Bond et al.....	173
Payment by Government of interest on condemnation award.....	271
Payment of cost of measuring and apportioning waters of St. Mary and Milk Rivers.....	427
Percolating waters in California.....	468
Powers of irrigation districts and of taxpayers within them.....	32
Public lands, survey of, bordering on a lake...	570
Railroad lands, assessment of, in irrigation districts.....	570
Ramshorn Ditch Co. v. United States.....	173
Reclamation Service contract on Boise project interpreted by court.....	468
Reclamation Service wins again in suit over seepage water.....	24
Relief of ex-service men.....	375
Right of landowner to protect his property from flood waters.....	330
Rights, abandoned water.....	329
Rights of way on the public domain.....	175
Right to attack validity of enlargement of irrigation districts.....	375
Roddis, E. E.....	25
Seepage, liability for, in California.....	571
Settlers, homestead rights of, who intermarry..	174
Severance of water right from ditch right.....	330
Smoot rural homes bill, the.....	269
State license tags for Federal motor cycles....	517
Subterranean water.....	330
Suit brought by water users on Boise project settled.....	425
Survey of public land abutting stream of water.	468
Trespass on public lands for oil.....	468
Water, appropriation of, in Utah.....	329
West Side Irrigation Co. case.....	328
World War, date of termination of.....	177

Law notes—Continued.

Wyoming-Colorado water-right case to be reargued.....	517
Yuma Mesa auxiliary reclamation fund.....	427
Lawson, L. M., Storage at Elephant Butte Reservoir, Rio Grande project.....	372
Leach, Glen C., Fish culture in connection with the irrigation projects.....	376
Leases, limitations on Government.....	570
Libraries, Reclamation Service.....	480
License tags for Federal motor cycles, State.....	517
Litigation affecting the Reclamation Service, 1902-1920.....	76
Little et al. v. Roof.....	24
Littlepage, Mrs. Louella, Project women and their interests.....	16, 66, 114, 155, 212, 261, 311, 364, 414, 460, 510, 564
Live stock and alfalfa on the Southwestern projects.	51
stock at the Klamath County fair.....	548
stock on new irrigated farms.....	61
Live-stock raising, sugar-beet production.....	310
Loan, committee on emergency public works recommendations, for construction.....	569
Longmire et al. v. Yelm Irrigation District.....	328
Longwell, J. S., Irrigation has helped materially to produce these results.....	302
Loomis, L., Reminiscences of the Sun River country	182
Los Angeles, Eachus v.....	571
Louisville & Nashville R. R. Co., Bramlette v....	427
Lowe, Antero & Lost Park Reservoir Co. v.....	329
Lower Yellowstone project at the State fair, Helena, Mont.....	584
project crop report, 1920.....	134, 135
project, home on.....	200
project, Montana, educational advantages on..	120
project office.....	402
Lynah, United States v.....	427
Lytel, J. L., Irrigation has helped materially to produce these results.....	303
Tieton exhibit, Washington State fair.....	499
M.	
McDowell, O. E., Malta High School, Milk River project, Mont.....	167
McGonagle, Brady v.....	329
McLaren v. Fleischer.....	374
Malta High School, Milk River project, Montana...	167
Maps and drawings, reproduction of.....	71
March weather in the Western States.....	227
Marketing, taking the mystery out of.....	164
Marks v. Twohy Bros. Co.....	330
Masons et al. v. United States (La.).....	468
May, Charles A., former service employee honored.	357
May weather in the Western States.....	333
Measurements of produce.....	110
Meisel, Miss Lydia H., "Get acquainted" write-ups.....	211

Members of water users' association not personally liable for assessments.....	Page.
Mercer, Payette-Boise Water Users' Association v. . .	570
Mesopotamia, irrigation in.....	73
Middlekamp v. Bessemer Irrigating Ditch Co.....	427
Midway Irrigation Co. et al. v. Snake Creek Mining & Tunnel Co.....	330
Milk check, what part of the farmer's represents profit?.....	14
Milk River irrigation project, International Joint Commission interprets treaty affecting Milk River irrigation project.....	515
payment of cost of measuring and apportioning waters of St. Mary and.....	427
project, irrigation has helped materially to produce these results.....	203
project, Montana, crop report, 1920.....	386, 387
project, Montana, Malta High School.....	167
Minidoka North Side pumping division, Idaho, surveys.....	123
project crop report, 1920.....	234, 235
project, Idaho, Jackson Lake Reservoir.....	423
project office and employees.....	96
the electric project.....	367
Mitchell, L. H., Education advantages on the Lower Yellowstone project, Montana.....	120
Mohler, Dr. John R., Prevention will cut farm animal loss by millions.....	11
Montana's most beautiful valleys, one of, the Flat-head project.....	557
Monthly progress reports.....	32,
81, 129, 185, 231, 281, 334, 382, 432, 481, 529, 573	
Moritz, E. A., Conveyance losses of water on U. S. Reclamation Service irrigation projects.....	180
Irrigation development.....	52
Kills duck with stones.....	74
resigns.....	152
Morris, Farwell, successful water user.....	15
Moss, ducks keep lateral free from.....	13

N.

Nalder, William H., Wood-stave pipe on projects of the Reclamation Service.....	567
National reclamation plan advocated.....	525
Nature's annual manifestation of benevolence to the desert.....	545
Nevada irrigation district act held constitutional...	330
Newell, Herbert D., Irrigation has helped materially to produce these results.....	355
Newlands project crop report, 1920.....	38
project office and force, Fallon, Nev.....	2
project, results of irrigation.....	102
News letter to projects.....	29
market, by wireless.....	369
New York Canal Co., Limited, v. Bond et al.....	468
North Dakota pumping project crop report, 1920..	40
pumping project, Williston Division, irrigation has helped materially to produce these results.....	251

Northern Pacific Railway Co. v. Walla Walla County et al.....	570
North Platte and Shoshone projects, land openings on the.....	410
Fort Laramie Division, crop report, 1920.....	286
Interstate Division, crop report, 1920.....	286
opening scenes at the.....	450
project, exchange of lands on.....	427
project land opening.....	451
Valley, Nebr.-Wyo., development in the.....	403
project, Nebraska-Wyoming, war veterans making good on.....	498
Valley, suggestions for future development..	3
November weather.....	28
Numbers, H. O.... 162, 219, 258, 309, 362, 411, 458, 506,	559

O.

Obstruction of stream, right of action for, accrues at date of injury.....	126
October weather in the Western States.....	572
Offutt, Armand.....	25
Oiled paper, wrapping apples in, cuts down scald loss.....	60
Oil leasing act.....	25
leasing act, lands subject to the.....	174
trespass on public lands for.....	468
Okanogan project and Salmon Lake Dam office and employees.....	354
project crop report, 1920.....	91
Omaha & N. P. Ry. Co. v. John Janecek.....	427
Street Railway Co., Jaynes v.....	427
Opening, North Platte project land.....	451
scenes at the North Platte.....	450
Operation and maintenance costs and accruals.....	168
and maintenance deficits prior to 1914 held collectible.....	75
and maintenance reports.....	32, 81, 129, 185, 231, 281, 334, 382, 432, 481, 529, 573

Oregon-Washington Railroad & Navigation Company <i>v.</i> Williams.....	126
Organization, Reclamation Service.....	98
Organizations, commercial, on United States Reclamation Service projects.....	279
Orland project Berkshires win fame for Nevada....	17
project crop report, 1920.....	34
project employees.....	298
Orr Extension Ditch Co., Shields <i>v.</i>	571
Overflow Ditch No. 1 et al., Terrace Irrigation District et al. <i>v.</i>	329
Overhead expense, Reclamation Service.....	98

P.

Paints, water gas and coal gas tar.....	21
Pampas Imperial project, Peru, irrigation in.....	113
Patent, form of, under act of May 20, 1920.....	126
Paul, Charles H., assumes added responsibilities..	478

Payette-Boise Water Users' Association (Ltd.), <i>v.</i>	Page.	Reclamation abroad—Continued.	Page.
Bond et al.....	173	San Luis Potosi, Mexico.....	113
Water Users' Association, Ltd., <i>v.</i> Cole et al....	425	Siam.....	113
Water Users' Association <i>v.</i> Griffiths.....	570	Sonora irrigation project, Mexico.....	310
Water Users' Association <i>v.</i> Mercer.....	570	Sukkur Barrage project on Indus River.....	429
Payment by Government of interest on condem-		Reclamation in Idaho.....	31
nation award.....	271	policy, comprehensive national, urged.....	252
Payne, John Barton, Secretary, Herbert C. Har-		progress in national land, in the United States..	572
den <i>v.</i>	375	Record cook book..... 18, 69, 116, 158, 216, 264, 315	525
Pellen, J. H., Reproduction of maps and drawings.	71	Record, every water user needs the.....	9
People <i>v.</i> Cardiff Irrigation District.....	375	Record index, 1920.....	299
Peru.....	429	results of Government.....	480
Peru Bottom Drainage District, Dryden <i>v.</i>	427	Service libraries.....	98
Philippine Government, appreciation from.....	466	Service organization.....	451
Piave Valley, Italy, Irrigation in the.....	380	Service, Secretary Fall appraisals.....	278
Pickering, Myron, Strawberry shortcake in October.	549	Service, summary of accomplishment by the...	24
Pieplant, selecting and cooking.....	313	Service wins again in suit over seepage water..	
Pigs, opportunities in growing feeder.....	562	Reservoirs, monthly conditions of principal Recla-	
Pork products, methods of preparing, on the farm..	562	mation Service..... 32, 81,	
Potato, new light on development of tubers in the..	459	129, 185, 231, 281, 334, 382, 432, 481, 529, 573	
Potatoes, irrigation of.....	60	regulating outlet valves for storage.....	299
Poultry farmers, suggestions for. 258, 309, 362, 411, 458, 506		Results of Government reclamation.....	203, 251, 302
Powers, Prof. W. L., The net duty of water.....	150	of irrigation.....	
Project city's program of work, a.....	163	Richardson, John F., Results of irrigation on the	
investigation of an irrigation.....	324	Newlands project.....	102
women and their interests..... 16, 66,		Rights of way on the public domain.....	175
114, 155, 212, 261, 311, 364, 414, 460, 510, 564		Rio Grande project crop report, 1920.....	288
Projects, Federal irrigation, annual water charges		project office employees..... 280, 296	
on, season of 1921.....	230	project, storage at Elephant Butte Reservoir..	372
Public lands, discretion of Secretary relative to....	328	project, water charges.....	170
lands, survey of, bordering on a lake.....	570	Roddis, E. E.....	25
Pumpelly <i>v.</i> Green Bay Co.....	427	Rollwitz et al., Bode <i>v.</i>	468
Punjab, India, irrigation projects in.....	380	Roof, Little et al. <i>v.</i>	24
		Ross, Andrew F., 1864-1921.....	303
R.		S.	
Railroad lands, assessment of, in irrigation districts.	570	Safford, Charles V., "Get acquainted" write-ups...	368
Ramshorn Ditch Co. <i>v.</i> United States..... 24, 173		St. Mary and Milk Rivers, payment of cost of meas-	
Rat-poisoning campaigns, variety means success in.	153	uring and apportioning waters of.....	427
Reardon <i>v.</i> San Francisco.....	571	St. Mary storage and Blackfeet project office and	
Reclamation abroad:		employees.....	448
Asia Minor.....	30	Salmon Lake Dam, Okanogan project and office	
Bond issue for irrigation works in Chile.....	278	and employees.....	354
Brazil.....	73	Salt River project crop report; 1920.....	82
British South Africa.....	30	project, delivery of water to.....	278
Canada.....	31	Valley Water Users' Association et al., Verde	
Canal to irrigate Culiacan Valley, Mexico.....	380	Water and Power Co. <i>v.</i>	330
Irrigation in Mayo Valley, Mexico.....	477	San Francisco, Reardon <i>v.</i>	571
Irrigation in the Piave Valley, Italy.....	380	San Luis Potosi, Mexico, irrigation in.....	113
Irrigation plan for central Alberta, Canada.....	380	Sater, J. E., El Paso; Project town and metropolis	
Irrigation project at Foochow, China.....	278	of the real Southwest.....	332
Irrigation projects in the Punjab, India.....	380	Scald loss, wrapping apples in oiled paper cuts	
Mesopotamia.....	73	down.....	60
Murray River irrigation agreement, Australia..	220	Schilling, H. M., Results of irrigation on the Uma-	
National Irrigation Congress to be held in Spain.	166	tilla project.....	102
Pampas Imperial project, Peru.....	113	Schlapkohl, Fred, Surveys, Minidoka North Side	
Peru.....	429	pumping division, Idaho.....	123
Reclamation project in the State of Rio de Jan-		Schlecht, W. W., resigns.....	113
eiro, Brazil.....	278		

LX

School advantages on the Lower Yellowstone project, Montana.....	120	Strawberry shortcake in October.....	549
Scobey, Fred C., The flow of water in concrete pipe.....	78	Valley project crop report, 1920.....	242
Scofield, C. S., Alfalfa and live stock on the southwestern projects.....	51	Valley project office and employees.....	352
The cause of hard lands.....	520	Valley project, operation of Strawberry Reservoir.....	471
Scrubber for semicircular flumes.....	58	Subterranean water.....	330
Secretary Fall appraises Reclamation Service.....	451	Successful water users:	
of the Interior, Hon. Albert B. Fall.....	146	Kerr, Frank M., Lower Yellowstone project, Montana-North Dakota.....	220
Seepage, damages on account of, from canal.....	427	Morris, Farwell, Yakima project, Washington..	15
liability for, in California.....	571	Sugar-beet production and live-stock raising.....	310
water, Reclamation Service wins again in suit over.....	24	Sukkur, Barrage project on Indus River.....	429
Settlers, homestead rights of, who intermarry.....	174	Sunflowers a good silage crop in some localities... for feed in the Southwest.....	259
Sheep, some diseases of.....	63	Sun River country, remipiscences of the.....	561
Sherman, Caroline B., Full measure for full price..	117	project, Fort Shaw Division, Montana, crop report, 1920.....	182
Market news by wireless.....	369	project, Greenfields Division, Part 1, Montana, crop report, 1920.....	437
Taking the mystery out of marketing.....	164	project office and employees.....	437
Shields v. Orr Extension Ditch Co.....	571	Survey of public land abutting stream of water....	178
Shoshone and Arrowrock.....	582	Surveys, Minidoka North Side pumping division, Idaho.....	468
project, Frannie Division, crop report, 1920....	347	Sutliff v. Sweetwater Water Co.....	123
project, Garland Division, crop report, 1920....	347	Swanton, W. I., Foreign visitors.....	571
project, irrigation has helped materially to produce these results.....	302	Government of the United States chart.....	370
project, land openings on the North Platte and..	410	Sweetwater Water Co., Sutliff v.....	571
project office and employees.....	400		
Siam, irrigation in.....	113		
Sierra Ancha development.....	371		
Silo, homemade.....	507		
solves winter feed problem for dairy farmers...	355		
Sinclair, S. L., Filing system for the farmer and engineer.....	331		
Smoot rural homes bill, the.....	269		
Smythe, Wm. E., Emancipation.....	250		
Smythe, William E., jr., Diary of a western boy in Europe.....	19, 70, 119, 159, 217, 265		
Snake Creek Mining & Tunnel Co., Midway Irrigation Co. et al. v.....	330		
Sonora irrigation project, Mexico.....	310		
South African engineer to study irrigation problems.	280		
Sows, keep brood, in winter as cheaply as possible..	14		
Spillway construction, Elephant Butte Dam.....	223		
Stabler, Herman, Fluorescein an aid to tracing waters underground.....	122		
State fair, Helena, Mont., Lower Yellowstone project at.....	584		
Stations, rating, for irrigation systems.....	320		
Steward, W. G., Easy method of determining discharge over weir having velocity of approach....	276		
Steward, W. G., Rating stations for irrigation systems.....	320		
Storage reservoirs, monthly conditions of principal Reclamation Service.....	32, 81, 129, 185, 231, 281, 334, 382, 432, 481, 529, 573		
Stratton, Geo. E., Irrigation has helped materially to produce these results.....	203		

	Page.		Page.
Umatilla project office and employees.....	179	Waters, percolating, in California.....	468
project, results of irrigation.....	102	right of landowner to protect his property from	
Uncompahgre project crop report, 1920.....	187	flood.....	330
project office and employees.....	144	Weddings, November.....	31
River flood, June, 1921.....	473	Weeds, chemical spray to kill.....	413
United States, Bigby <i>v.</i>	517	Weiss, Andrew, Development in the North Platte	
United States, Bothwell, <i>v.</i>	221	Valley, Nebraska-Wyoming.....	403
United States ex rel. McCullough et al. <i>v.</i> Lane,		The North Platte Valley: Suggestions for	
Secretary of the Interior.....	328	future development.....	3
United States, Gibbons <i>v.</i>	517	Well, distinction as to rights in a, and the pump	
United States, Hart <i>v.</i>	517	connected therewith.....	24
United States, John E. Bennett <i>v.</i>	24	West Side Irrigation Co. case.....	328
United States, Lane et al. <i>v.</i>	570	Whittemore, W. L., Operation of Strawberry Reser-	
United States (La.), Masons et al. <i>v.</i>	468	voir, Strawberry Valley project.....	471
United States <i>v.</i> Lynah.....	427	Widtsoe, Dr. John A., What is excessive irrigation?..	518
V.		Williams, Oregon-Washington Railroad & Naviga-	
Valleys of Elephant Butte, The.....	418	tion Co. <i>v.</i>	126
Values, project land.....	452	Williston program of work.....	163
Verde Water & Power Co. <i>v.</i> Salt River Valley		Wireless, market news by.....	369
Water Users' Association et al.....	329	Wood box, the.....	68
Visitors, foreign.....	370	Wood-stave pipe on projects of the Reclamation	
Vitamines.....	67	Service.....	567
Volpi, Carlos A., courtesies appreciated by.....	23	Work, outlook for new.....	546
W.		World War, date of termination of.....	177
Walker River Irrigation District, Hendrich <i>v.</i>	330	Worms, new method to control, in pigs.....	563
Walker River Irrigation District, Hendrich <i>v.</i>		Wright, C. C., Miniature farm.....	499
Walker River Irrigation District.....	329	Wyoming-Colorado water-right case to be reargued.	517
Walker River Irrigation District, Walker River		Y.	
Irrigation District, Hendrich <i>v.</i>	329	Yakima project, self-releasing choker, used in	
Walla Walla County et al., Northern Pacific Rail-		clearing reservoir sites.....	29
way Co. <i>v.</i>	570	project, Sunnyside Division, crop report, 1920..	344
Wall <i>v.</i> Basin Mining Co.....	570	project, Sunnyside Division, employees.....	202
War veterans making good on North Platte project,		project, Sunnyside Division, irrigation has	
Nebraska-Wyoming.....	498	helped materially to produce these results...	303
Water charges, Rio Grande project.....	170	project, Tieton Dam, Wash.....	475
delivery of, to Salt River project.....	278	project, Tieton Division, crop report, 1920.....	345
gas and coal gas tar paints.....	21	project, Tieton Division, employees.....	202
right case to be reargued, Wyoming-Colorado..	517	project, Tieton exhibit, Washington State fair.	499
right, severance of, from ditch right.....	330	project, Yakima office, employees.....	248
Water rights, abandoned.....	329	Yelm Irrigation District, Longmire et al. <i>v.</i>	328
subterranean.....	330	Youngblutt, F. C., Butte County fair, South Dakota.	547
the net duty of.....	150	Yuma Mesa auxiliary reclamation fund.....	427
user, a successful.....	220	Mesa Division of the Yuma project, Arizona...	319
Waters, Congress consents to agreement between		project, Arizona, The Yuma Mesa Division of	
States respecting, of Colorado River.....	469	the.....	319
		project crop report, 1920.....	232

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The Reclamation Record

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REPORT ON AN ENGINEERING INVESTIGATION ON THE MAINTENANCE OF DRAINS ON RECLAMATION SERVICE PROJECTS.

THERE are three important questions to be considered in drain design; first, will the value of the crops produced upon the drained land justify the expenditure required for the drains; second, will it be possible to maintain the drains in such condition that they will continue to keep the water table down; and, third, what will be the cost of maintenance. The selection of the type of drain to be used, the slopes of grade lines to be adopted, and, in case of closed drains, the size of tile, depend to a large extent upon the two factors last mentioned. The most important consideration is to keep the drains in such condition that they will maintain a low water table. Regardless of financial limitations, conditions may exist where this would be impossible and the whole purpose of drain construction would be frustrated. If conditions are favorable for the maintenance of a low water table, the next consideration is that of designing drains which will require the least expenditure to maintain in working order.

OPEN DRAINS.

Soil.—The type of soil encountered is an important factor in maintenance, because erosion and silt deposit are causes of expensive work. For purposes of drainage, soils may be divided into two classes; those which give up their water readily and hold their slopes in banks and those which do not give up their water readily, and will not hold their slopes. Of the soils usually encountered, sand and gravel are in the first class, and silt, clay, sandy clay, and shale are in the second class. Although sand flows readily when fully saturated, it soon gives up the greater part of its water when drainage is provided. Coarse sand and gravel are the most desirable soils through which to maintain drains. The soils in the second class, on the other hand, hold in the form of capillary and hydroscopic water probably the larger proportion of the water originally contained. They erode easily and flow readily when saturated and thus will not maintain true slopes.

Floods.—Floods increase the expenditure for maintenance by the erosion and silting of drains and the

washing out of structures. It is impossible to design drains which will always be flood proof because grades must conform to surface slopes and these are frequently steep in the upper reaches and become much flatter as the outlet is approached. This results in erosion where velocities of flow are excessive, and in deposition of material where velocities are decreased because of flat grades. Again, it is readily seen that if drains are designed to carry infrequent, abnormal flood discharges, the velocity will be so small during normal flow that a great deal of silt will be deposited. Vice versa, if they are designed for the normal seepage flow, the flood flow may destroy them. The usual procedure is to provide sufficient capacity for the maximum usual annual flow and repair damage done by abnormal flows which occur at infrequent intervals.

Plant growth and debris.—The growths which commonly occur in drains are cat-tails, Russian thistles, and moss. Débris is washed and blown into the drains from the surrounding land. It floats downstream until a lodging place is found, where it gradually accumulates and forms a barrier. Fences across drains are objectionable on this account, for unless their bottoms are higher than the maximum water level they catch floating debris and form an obstruction which ponds the water above.

Tumble weeds are a constant source of trouble. The drain banks form windbreaks and cause those which are carried by the wind from the surrounding land to be dropped into the channel, where they gradually pile up and obstruct the flow. They are easily burned when dry, but when wet must be removed from the drain.

Structure repairs.—Repairs are usually made necessary by the action of surface water flowing into the drains, and where this water can be diverted from around the structures the repairs are reduced to a minimum. Burrowing animals also contribute to structure washouts by burrowing under and around cut-off walls, allowing water to get behind and under structures and undermine them.

CLOSED DRAINS.

Soil.—Tile drains to function properly must be kept true to grade and alignment. If the soil surrounding the tile is not sufficiently stable to support it, the tile will become misplaced and the grade alignment will be destroyed, causing silt to deposit and the tile finally to collapse. Failures may occur soon after construction or after years of service, and they have occurred even when the tile was laid on wooden cradles.

Floods.—Most of the flood damage to closed drains occurs at the outlet of the drains by washing out the protecting bulkheads. It is very important not to place a tile drain outlet in a natural depression where flood waters are liable to flow. Where this is done, surface water flowing along the depression may wash out the bulkhead and sometimes uncover the tile for a distance above it.

Plant growth and debris.—If trap boxes are built with their tops above the ground surface and are kept closed, there is no opportunity for debris to enter the tile. The tops are sometimes left open, however, or boards are pried from the sides for the

purpose of dipping out stock water or for allowing unusual flows of surface water to enter. Buckets sometimes get away from the person dipping the water and lodge in the tile where they are very difficult to dislodge, often making it necessary to uncover and remove the tile. Where surface water is allowed to enter, it carries with it some debris, part of which may be caught in the box and part of which may go into the tile.

Plant growth affects closed drain maintenance by means of the roots entering the tile through the joints and filling them. The worst offenders are willow roots, with alfalfa roots a close second. The roots enter the tile through the joints and multiply very rapidly inside, forming a fine dense network often resembling fine-cut tobacco. They finally clog the tile completely. This difficulty is a serious problem in maintaining closed drains and one of the hardest to combat.

MAINTENANCE METHODS.

A preventive in maintenance work is worth more than a cure. The rapidity with which conditions become worse has been emphasized in the foregoing

Unit costs of maintenance of open drains constructed and maintained by the U. S. Reclamation Service.

Project.	Period.		Average of total length of drains on project (miles). ¹	Unit detail costs per mile-year.					
	Dates.	Number of years.		Patrolling.		Clearing of weeds and debris.		Clearing of silt and caved material.	
				Per mile-year.	Per cent.	Per mile-year.	Percent.	Per mile-year.	Percent.
Carlsbad.....	1917-1921	4 ²	11.14	\$18.14	12.8	\$17.71	12.5	\$58.33	41.3
Huntley.....	1917-1921	4 ²	16.00	.40	0.8	7.03	14.4	23.62	58.4
Klamath.....	1917-1921	4 ²	82.25	.02	.....	4.88	12.7	18.84	48.8
Newlands.....	1917-1921	4 ²	14.23	31.96	17.4	21.57	11.7	47.30	25.7
North Platte (Interstate).....	1917-1920	4	34.21	13.03	6.6	17.71	9.0	22.55	11.5
Rio Grande.....	1918-1921	3 ²	132.17	9.00	16.4	29.16	53.1	7.38	13.5
Shoshone.....	1917-1921	4 ²	21.88	.90	3.2	8.35	29.2	1.58	5.5
Umatilla.....	1917-1921	4 ²	10.00	.11	.....	61.47	41.0	56.80	37.8
Yuma.....	1918-1921	3 ²	29.25	.....	.....	23.48	5.4	.....	.....
Totals and averages.....	1917-1921	4.37	351.13	6.10	8.5	17.96	25.0	16.32	22.7

Project.	Unit detail costs per mile-year.						Unit field cost per mile-year.	Overhead.		Total unit cost per mile-year.	Average cost per year.
	Repairs to structures.		Minor expenses and plant and equipment.		Miscellaneous.						
	Per mile-year.	Per cent.	Per mile-year.	Per cent.	Per mile-year.	Per cent.		Per mile-year.	Per cent.		
Carlsbad.....	\$3.41	2.4	\$0.39	0.3	\$1.00	0.7	\$99.05	\$42.26	30.0	\$141.31	\$1,576.61
Huntley.....	3.73	7.6	3.41	6.9	3.82	7.8	47.06	1.94	3.9	49.00	788.54
Klamath.....	6.47	16.8	.03	.....	.....	.....	30.24	8.33	21.6	38.57	3,177.40
Newlands.....	15.31	8.3	5.40	2.9	11.20	6.1	132.74	51.36	27.9	184.11	2,623.89
North Platte (Interstate).....	89.05	45.4	14.53	7.4	.....	.....	156.89	39.38	20.0	196.27	6,714.70
Rio Grande.....	.71	1.3	1.52	2.8	.74	1.4	48.51	6.34	11.6	54.86	7,264.95
Shoshone.....	12.36	43.3	1.18	4.1	.26	0.9	24.65	3.91	13.7	28.56	626.00
Umatilla.....	1.76	1.2	8.00	5.3	.....	.....	128.14	21.97	14.6	150.12	1,514.10
Yuma.....	.....	.....	19.73	4.5	\$362.35	\$82.1	\$43.21	\$35.44	\$18.0	\$441.00	\$12,922.82
Totals and averages....	11.63	16.2	3.90	5.4	\$.96	\$ 1.3	\$56.87	\$14.76	\$20.6	\$71.63	\$25,151.47

¹ The average of the total miles of open drain for the years considered, not the mileage on which maintenance was actually done.

² This represents the operation of two permanent pumping plants, including overhead expense.

³ Does not include Yuma pumping plants.

⁴ Includes Yuma pumping plants.

discussion and it is much better to forestall conditions which will decrease the efficiency of the drains than to remedy them after they have reached serious proportions. This holds for both types of drains.

Open drains.—Patrolling may be considered as a preventive, and the cost of this item is money well spent. A ditch rider, by calling attention to a condition at its inception or by doing a few minutes' work himself at the proper time, may save large future expenditures.

Silt and caved material should be kept cleaned from the drain bottoms. Where a large system of drains is involved, a small drag-line excavator, traveling either on the crown of the bank or on the berm, is the best machine for cleaning. The original bottom width and grade line should be maintained as closely as possible. In connection with this, all drainage inlets should be kept clear and in repair. Otherwise surface water will accumulate until it flows over the banks, depositing the material from the banks in the bottom of the drain. Where the soil will not maintain a true slope, it is frequently necessary to construct wire or brush protective work at the toe of each slope to keep the channel clear.

Weeds and debris should be removed at frequent intervals and not allowed to collect until erosion and silt deposit have resulted and the bottom become

crooked. In one case a wire fence supported on steel posts has been erected to catch tumble weeds before they blow into the drain, the weeds being burned on the fence at intervals. Inflammable debris is removed from the drain and burned when dry. Non-inflammable material is thrown out where it can not get into the drain again.

Repairs to structures should be made as soon as the need for repair exists. Small washouts around structures can be repaired by a few shovelfuls of earth thrown in by the ditch rider. Larger repairs may require a crew of men. In connection with this and also with the sloughing in of banks it is necessary to exterminate burrowing animals, such as muskrats, pocket gophers, and ground squirrels. The most effective method of extermination is by poisoning. Shooting is often resorted to, but is less effective.

Closed drains.—Patrolling bears practically the same relation to closed drains that it does to open drains. The ditch rider should see that all drains are operating properly by an inspection from the trap boxes and should see that trap boxes are kept closed. Foreign material, such as silt and debris, should be removed from the boxes before it attains a depth maintenance costs for the periods covered on the that will cause it to pass into the tile. Silt is usually cleaned out by dipping with a water bucket

Unit costs of maintenance of closed drains constructed and maintained by the U. S. Reclamation Service.

Project.	Period.		Average of total length of drains on project (miles). ¹	Unit detail costs per mile-year.					
	Dates.	Number of years.		Patrolling.		Clearing tile and trap boxes.		Repairs to tile and trap boxes.	
				Per mile-year.	Per cent.	Per mile-year.	Per cent.	Per mile-year.	Per cent.
Carlsbad.....	1917-1920	4	3.65			\$24.24	24.3	\$37.56	37.6
Huntley.....	1917-1921	4½	47.52	\$0.16	0.2	10.80	12.8	55.08	65.3
Klamath.....	1919-1920	2	8.00			5.96	68.8	.36	4.2
North Platte (Interstate).....	1917-1920	4	14.20	1.29	1.4	52.16	57.2	20.70	22.7
Newlands.....	1918-1919	2	3.99						
Shoshone.....	1917-1921	4½	81.17	.50	2.5	6.60	32.8	9.35	46.4
Totals and averages.....	1917-1921	3.56	158.53	0.53	0.9	14.72	25.0	31.00	52.6

Project.	Unit detail costs per mile-year.						Unit field cost per mile-year.	Overhead.		Total unit cost per mile-year.	Average cost per year.
	Minor expense and plant and equipment charges.		Replacement of drains.		Hydrometry.			Per mile-year.	Per cent.		
	Per mile-year.	Per cent.	Per mile-year.	Per cent.	Per mile-year.	Per cent.					
Carlsbad.....	\$1.24	1.3					\$63.05	\$36.76	36.8	\$99.82	\$364.27
Huntley.....	3.08	3.6	\$5.48	6.5			74.60	9.77	11.6	84.37	4,015.04
Klamath.....							6.32	2.33	27.0	8.65	69.25
North Platte (Interstate)....	4.80	5.2					78.95	12.27	3.4	91.22	1,295.36
Newlands.....	10.60	59.8					10.60	7.14	40.2	17.75	70.82
Shoshone.....	1.00	4.9			\$0.03		17.48	2.65	13.2	20.14	1,637.34
Totals and averages....	2.54	4.3	2.15	3.6	.01		50.95	7.98	13.5	58.93	9,342.51

¹ The average of the total length of closed drains for the years considered, not the mileage on which maintenance was actually done.

having holes punched in the bottom to allow the water to drain through.

Deposition of silt in the tile is not a serious problem as the natural flow of water usually prevents it. The usual obstructions are caused either by roots or by the tile breaking or settling. The only remedy in either case is to uncover the tile and remove the obstruction. Prevention is again the best policy. The growing of roots in the tile can be largely overcome by removing all trees within a distance from the drain from which the roots would be liable to reach it, and by prohibiting the planting of deep-rooted crops directly over the drain. An effort has been made to procure a chemical which would kill the

roots in the tile, but nothing satisfactory has yet been found.

Maintenance cost of open and closed drains.—The accompanying tables give maintenance costs for open and closed drains on the projects of the Reclamation Service for periods averaging 4.37 and 3.56 years, respectively. These periods are too short to justify any general conclusion as to what the relative maintenance costs of the two types of drains will be over an extended term of years. It is thought, however, that they may be found of interest as showing actual maintenance costs for the periods covered on the various projects.—C. E. Lounsberry, assistant to drainage engineer, U. S. R. S.

REPORT ON EXPERIMENTAL INVESTIGATIONS ON THE USE OF ALUMINUM SULPHATE ON ALKALI LAND ON RECLAMATION SERVICE PROJECTS.

THERE are many tracts of land in the irrigated section of the western United States that are unproductive as a result of containing too much alkali. It is frequently assumed that this condition, particularly when it occurs in the older irrigated sections, is due to excessive irrigation. As a matter of fact this is not always the case. If the soil and subsoil were sufficiently porous so that the irrigation water could soak down readily, then the harmful salts would quickly be washed away; but this can not occur where the soil or subsoil is impervious to the free movement of water.

Where natural subsoil drainage is not sufficient to permit the free outflow of excess percolating water, artificial drainage must be provided if serious damage to the irrigated land is to be avoided. The safest preventive of alkali troubles is subsoil drainage. The more salt that is carried in irrigation water the more drainage is needed, because a larger proportion of the water applied to the land should be allowed to percolate downward to carry the salts away.

Some irrigated land and some desert land is found to be difficult to use for crops because it does not "take water" readily. Such soils may be unproductive not because they are too salty for crops, not because they are water-logged, but because the irrigation water does not soak into them.

This condition is due to the presence in the soil of gelatinous silicates, chiefly sodium silicate or water glass. This material appears to absorb water rather than to dissolve in water, and it checks or prevents the normal percolation of water through the soil. This sodium silicate is often confused with sodium carbonate or "black alkali" because both substances give an alkaline reaction and because the two commonly occur together in arid or irrigated soils.

Where irrigated soils do not take water readily or show other symptoms that are commonly associated with "black alkali," this condition may be remedied by the use of alum or aluminum sulphate. Aluminum sulphate is readily soluble in water. When applied to an alkaline soil it neutralizes the alkalinity through the formation of an insoluble aluminum silicate, the sodium of the sodium silicate uniting with the sulphate of the aluminum sulphate and remaining in solution as a neutral and relatively harmless salt, which may be leached out of the soil by heavy irrigations.

Aluminum sulphate is an article of commerce extensively utilized in manufacturing and for clearing turbid water in reservoirs. At the present time it is manufactured at several places in the eastern United States by treating a pure clay, known as bauxite, with sulfuric acid. When manufactured in this way, aluminum sulphate costs about \$30 per ton at the shipping point. This price, together with the freight rate, would make it too expensive to justify its general use in the reclamation of alkali land.

Fortunately there are numerous deposits of alum and alum-bearing rocks and shales in the western United States, and some of these occur in proximity to the irrigated sections. One such deposit has been found on the Newlands project in Nevada, from which material has been obtained for experimental and demonstration purposes. There are known to be several other deposits in Nevada. Deposits have been reported also from southwestern New Mexico near the headwaters of the Gila River and in Mexico south of the Imperial Valley.

In addition to these deposits, in which some of the alum occurs in soluble form, there are other deposits of alunite, which is an alum-bearing rock, but is insoluble in its natural state. It is possible to render

it soluble by heating, grinding, and treating it with sulfuric acid.

These present and potential supplies of alum located in the West should make it possible to reclaim, at moderate cost, much of the irrigated land that has been abandoned because of alkali.

In the experimental work so far done in the use of alum it has been found that applications at the rate of 2 tons per acre have shown a very beneficial effect on the permeability of the soil. Where the soil is very fine, such as a clay, applications as light as 2 or 3 tons per acre have improved the permeability, but have not changed the character of the soil as to

its hardness on drying. When as much as 10 tons per acre has been used, a very marked change has been shown in the physical condition of the soil on drying. Instead of becoming hard when dry the treated soil becomes soft and easy to work. In other words, the heavy applications of alum have greatly improved the tilth of alkaline clay soils.

It is suggested that those irrigation farmers who have hard alkali soils try on a small scale the use of alum. It is highly desirable to determine in advance by small and inexpensive experiments just what the effect of alum will be before undertaking its use on a large scale.—*C. S. Scofield.*

RECLAMATION LAW NOTES.

Liability of Government for Seepage.

ON November 21, 1921, the United States Supreme Court handed down an important opinion (66 L. ed. 80) concerning the responsibility of the Reclamation Service on account of seepage developing from Federal irrigation projects. The decision was rendered in two separate suits affecting the Newlands (formerly Truckee-Carson) project in Nevada, brought in the Court of Claims by the John Horstmann Co. and the Natron Soda Co. (54 Ct. Claims, 169, 214). The text of the opinion of the Supreme Court follows:

Actions in the Court of Claims to recover, respectively, the sums of \$35,000 and \$170,000, alleged values of certain properties charged to have been taken and appropriated by the United States.

Both appellants are corporations and are, respectively, owners of lands in Churchill County, State of Nevada, surrounding and including lakes known as Little Soda Lake and Big Soda Lake. The Horstmann Co. is owner of the former and the Natron Soda Co. is owner of the latter.

In 1906 each appellant was manufacturing soda from the waters of the respective lakes, and the controversy of the cases turns upon the condition of the lakes at that time and their condition after an irrigation project was instituted by the Government, called the Truckee-Carson project.

The lakes are situated in an area known as the Carson Sink Valley, and in 1906 were dry bodies and the source of soda supply to the respective appellants.

From prior to 1867 to 1906 the levels of the lakes had not varied more than 2 feet. In 1906 the United States Reclamation Service, acting under the authority of acts of Congress, constructed the Truckee-Carson project, consisting of dams, canals, and other structures, whereby through the usual means large quantities of surface waters theretofore confined to the watershed of the Truckee River were in 1906 and during each year since then transported to the watershed of the Carson River and distributed to various and sundry tracts of land in the Carson River Valley for irrigation purposes.

Details of the project need not be given, but with its advent the body of the ground water in the entire

section covered by the project rose, and the volume of water in the lakes has continually increased, and the level of the lakes has risen about 19 vertical feet during the period of 1906 to 1916, in consequence of which the value of the properties of appellants has been destroyed, that of the Horstmann Co. being \$9,000 and that of the Natron Co. being \$45,000, according to the findings of the Court of Claims.

There have been additions to the canal project, and its ultimate development contemplates the reclamation of 206,000 acres of land. At present the canals of the project ramify an area of 100,000 acres.

No negligence on the part of the United States is alleged or proven.

The conclusion of the court was that appellants were not entitled to recover, hence it dismissed the actions and rendered judgments against appellants for costs of printing the records. Motions for new trials were made and denied.

The question of the jurisdiction of the Court of Claims of the actions is intimated, if not urged, based on the allegation in the petition of the Horstmann Co. that, owing to the porous condition of the soil in the canals and ditches and "the lack of proper lining in said canals and ditches, and owing to the way said canals and ditches were built and to the natural condition existing," the water flowed into the lake and seeped and percolated through the canals and ditches.

The Government is cautious in its characterization of this allegation and says that it "apparently based the claim of the Horstmann Co. upon the tort," and adds if the claim be so based the Court of Claims had no jurisdiction, "as the Government has never waived its immunity from suit in such cases."

We do not think, however, that the allegation was intended as an accusation of negligence, but rather to forestall a defense, based on the character of the works, that from them there could be no causal connection between the project of the Government and the rise of waters in the lakes. The Court of Claims besides explicitly found that there was no negligence.

Upon the merits the contention of the Government is the absence of such causal connection between its works and the injury to the properties of appellants. It concedes, however, that the contention is a deduction from obscure findings, the Court not finding affirmatively that a causal connection did not exist. "Its decision was the Scotch verdict of 'not proved,'" to quote counsel.

Appellants oppose the Government's contention and deductions, oppose to them the difference in conditions before and after the execution of the canal project, and their reasoning seems to have the support of the methods that the world employs in the investigation of its phenomena and instances.

Post hoc, therefore, *propter hoc* may not be confidently asserted, but there is a suggestion of effect and cause in it, of sequence, something more than unrelated occurrence. And of this there seems to be pertinent application in the present case. The transfer of water from one watershed to another—from the Truckee River watershed to the Carson River watershed—accompanied by an increase of the water in the lakes from a level not varied in 29 years more than 2 feet to 19 vertical feet would seem to demonstrate this as an effect of the canal project. And there can be no doubt of the adequacy of the cause even though, to quote from the findings, "percolating waters are hidden and invisible" and that "It does not appear from the evidence how they are governed or how they move underground." Their effects above ground, a rise of water in the lakes from 2 feet to 19 feet of water, are certainly visible and unmistakable. Indeed, the court explicitly found that with the advent of the irrigation project the body of ground water in the entire section covered by the project rose.

However, we need not arbitrate the contentions, but will assume with appellants that there was casual connection between the work of the Government and the rise of waters in the lakes, and the consequent destruction of the properties of appellants, but it does not follow that the Government is under obligation to pay therefor, as for the taking of the properties.

The Court of Claims, as we have seen, decided against such obligation and to its reasoning it would be difficult to add anything. The reasoning of the court is attacked, however, by appellants, and *United States v. Lynah*, 188 U. S. 445, is adduced against it.

The instance of the cited case and a certain generality in its reasoning and basic principle gives plausible support to the contention. It is declared that the rule deducible from prior cases which are reviewed is that the appropriation of property by the Government implies a contract to pay its value, and it is further declared that there need not be a physical taking, an absolute conversion of the property to the use of the public. It is clear from the authorities, it is said, that if by public works the value of the property of an individual is substantially destroyed, its value is taken within the scope of the fifth amendment. And it was decided that "the law will imply a promise to make the required compensation, where property to which the Government asserts no title is taken, pursuant to an act of Congress, as private property to be applied for public use." *Tempel v. United States*, 248 U. S. 121, 129, 130.

This generality has had exception in subsequent cases. It is to be remembered that to bind the Government there must be implication of a contract to pay, but the circumstances may rebut that implication. In other words, what is done may be in the exercise of a right and the consequences only incidental, incurring no liability. *Bedford v. United States*, 192 U. S. 217; *Kansas v. Colorado*, 206 U. S. 46; *Tempel v. United States*, *supra*. And there is characterization of the *Lynah* case in *United States v. Cress*, 243 U. S. 316.

We think the cases at bar are within the latter decisions and it would border on the extreme to say that the Government intended a taking by that which no human knowledge could even predict. Any other conclusion would deter from useful enterprises on ac-

count of a dread of incurring unforeseen, and immeasurable liability. This comment is of especial pertinence. The result of the Government's work to the properties of plaintiffs could not have been foreseen or foretold is a necessary deduction from the findings of the Court of Claims. The court found that there is obscurity in the movement of percolating waters, and that there was no evidence to remove it in the present case, and necessarily there could not have been foresight of their destination nor purpose to appropriate the properties.

In the *Natron* case the company's predecessors in interest conveyed a right of way to the United States of certain lands of the company, and prior to the conveyance agreed with the United States that in consideration of the benefits to be derived from the construction of the works through the lands conveyed that the United States might construct canals and ditches on and across the land, and further agreed "that in consideration of the premises the first party hereby releases the second party from all claims for damages for entry, survey, or construction of said works."

The Government adduces the agreement and conveyance in opposition of the right of the *Natron Soda Co.* to recover. The company resists this effort. We, however, are not called upon to pass upon it. Independently of the agreement the company's claim is to be rejected.

Water Rights in South Dakota.

On November 10, 1921, the Supreme Court of South Dakota in *Cook v. Evans* (185 N. W., 262), broke new legal ground in that State relative to the use of water. We quote from the opinion:

We are called upon to decide for the first time the effect of the Act of March 3, 1877 (19 Stat., 377). Reading that act in connection with the previous acts of Congress in relation to public lands, we are of the opinion, as held in *Hough v. Porter*, 51 Or. 318, 95 Pac. 732, 98 Pac. 1083, 102 Pac. 728, that, by said Act, Congress did sever from all public lands not then lawfully entered upon, all rights to the use of the waters adjacent thereto except the riparian right to use such waters for domestic purposes; and that the Government, by said Act, did dedicate to the public, and thus render subject to appropriation in accordance with existing or future laws and customs, for irrigation, mining, manufacturing, and other proper purposes, all remaining public waters. The reasoning in the opinion in *Hough v. Porter*, *supra*, is so lucid and convincing that we feel justified in resting our ruling thereon without referring to other authorities except those cited in such opinion. * * *

The court, in a case such as this, involving as it does such great public and private rights, and in which it has jurisdiction over all parties in interest, should attempt to determine, and to put into effect, the best methods of irrigation, in order to safeguard the best interests of all concerned, including the public. It may well be that the evidence of witnesses, practical farmers, and experts will satisfy the trial court that it would be better to require the claimants under some of the ditches to take water from the stream during only certain days of each week, and the claimants under the other ditches to take water from such streams during the remaining days of such week, rather than to have water running through all the ditches all the time. In such case, the judgment should so provide, allowing of course for an increased flow during such days.

Delinquent Construction Accounts on Flathead Project not Subject to Penalties.

The Flathead Indian Federal irrigation project in Montana is not a reclamation project as contemplated by the act of June 17, 1902 (32 Stat., 388), and amendments thereto, and is not subject to the provisions of the act of August 13, 1914 (38 Stat., 686). In providing for partial reimbursement of construction costs under the Indian appropriation act of February 14, 1920 (41 Stat., 409), the Secretary of the Interior is without authority to require payment of a penalty by either Indians or white settlers in case of a delinquency in payment. (Opinion Solicitor for the Department of the Interior, Nov. 15, 1921.)

—Ottamar Hamel.

Report on Yakima Project Flood.

Project Manager Lytel reports that on December 10 it began raining at the lakes and continued steadily for three days, accompanied by a chinook wind, and the discharge of all the mountain streams increased rapidly. The flood reached its maximum on the 13th, with a flow at the Sunnyside dam of 36,000 second-feet. Had the flood been much greater, it is believed that serious damage would have resulted all along the river, but it was possible to keep the flow to 36,000 second-feet by storing about 90,000 acre-feet in Cle Elum, Kachess, Keechelus, and Bumping. If the permanent dam at Cle Elum had been built, it is probable that the maximum discharge at Sunnyside dam could have been kept down to about 25,000 second-feet, as the Cle Elum River below the crib dam at Cle Elum Lake discharged a maximum of about 13,000 second-feet at the peak of the flood. With the completion of the storage program on the Yakima project the possibilities of damage from floods should be greatly reduced by storing in the reservoirs at the time of maximum run-off and discharging what is not needed after the flood passes.

The only damage to the Reclamation Service works was the erosion of the canal banks at the Sunnyside Canal intake, necessitating raising the bank and riprapping certain portions. •

The Twentieth Annual Report.

The Twentieth Annual Report of the Reclamation Service was issued early in December, 1921, and a limited number of copies are available for distribution.

Three acres of asparagus on the Salt River project returned a gross value of \$3,300 in 1920, the highest value per acre of any crop produced in that year.

REPORT OF COMMITTEE ON BUSINESS METHODS.

The Reclamation Record.

Chief Engineer Weymouth recommended some months ago the appointment of a committee on business methods in the Reclamation Service to suggest improvements, especially economies. One of the committee's recommendations related to the policy regarding the RECLAMATION RECORD, which we expected to put into effect in the present issue.

However, pending specific authority from Congress, the RECORD is being issued under a regulation of the Congressional Joint Committee on Printing as an administrative and statistical report of the operations of the Reclamation Service. Its size has necessarily been reduced materially, and it will contain no illustrations, unless necessary for a proper understanding of the printed matter.

Reclamation Record Index, 1921.

Copies of the index to the RECLAMATION RECORD for 1921 are now available for distribution and may be obtained on application to the Chief Clerk, United States Reclamation Service, Washington, D. C., as long as they last.

Preserve your copies of the RECORD, bind them with the index, and you have a handy reference book on Federal irrigation.

More than 850 miles of canals were operated on the Salt River project, Arizona, in 1920, and the water delivered to the land amounted to 595,000 acre-feet, or 2.9 acre-feet per acre for the area under cultivation.

There were 12 public schools, 8 churches, and 6 banks reported in 1920 on the Shoshone project, Wyoming. The banks reported a capital stock of \$125,000, deposits of \$644,000, and 2,600 depositors.

The deposits in the banks on the Salt River in 1920 amounted to \$24,426,000, and the number of depositors was estimated at 35,000.

The garden area of 180 acres on the Huntley project, Montana, produced crops in 1920 with a gross value of \$92.08 per acre. Potatoes were second with a gross value per acre of \$91.77.

ADMINISTRATIVE AND STATISTICAL PROGRESS REPORTS FOR DECEMBER, 1921.

Monthly conditions of principal Reclamation Service reservoirs for December, 1921.

[Elevation above sea level.]

State and project.	Reservoir.	Available capacity in acre-feet.	Elevation.		Storage in acre-feet.			Out-flow in acre-feet.	Elevation of water surface.		
			Spill-way crest. ¹	Lowest gate sill. ²	Beginning of month.	End of month.	Maximum.		Beginning of month.	End of month.	Maximum.
Arizona, Salt River.....	Roosevelt ³	1,305,000	2103	1903	616,313	626,605	626,605	.....	2074.68	2075.61	2075.61
California, Orland.....	East Park.....	51,000	1199.68	1111.68	7,515	11,870	11,870	.....	1161.22	1168.23	1168.23
Idaho:											
Boise.....	Arrowrock.....	280,000	3211	2956	26,380	62,600	62,600	38,178	3068	3107	3107
	Deer Flat.....	177,000	2518	2188	63,683	89,749	92,174	.....	2503.61	2507.54	2507.88
Minidoka.....	Lake Walcott.....	95,180	4245	4226	85,400	84,940	86,330	396,205	4244.16	4244.12	4244.24
	Jackson Lake.....	847,000	6769	6730	227,330	260,220	260,220	.....	6742.24	6743.84	6743.84
Montana:											
Milk River.....	Nelson.....	27,000	2214	2200	20,720	19,700	20,720	.....	2210.2	2209.8	2210.2
St. Mary storage.....	Sherburne.....	66,000	4783	4720	.....	.....	.....	.....	.....	.....	.....
Sun River.....	Willow Creek.....	16,700	4130	4085	7,381	8,152	8,152	.....	4118.6	4120	4120
Nebraska-Wyoming, North Platte.	Pathfinder.....	1,070,000	5852	5670	558,390	583,530	583,530	5,425	5822.57	5824.47	5824.47
	Lake Alice.....	11,400	4182	4159	6,689	5,853	6,689	.....	4175.2	4173.8	4175.2
	Lake Minatare.....	60,766	4125	4074	54,650	53,422	54,650	.....	4122.1	4121.5	4122.1
Nevada, Newlands.....	Lake Tahoe.....	120,000	6230	6224	.....	.....	.....	9,294	6224.6	6224.89	6224.89
	Lahontan.....	290,000	4162	4060	166,160	179,080	179,080	2,390	4148.6	4150.6	4150.6
New Mexico:											
Carlsbad.....	McMillan.....	45,000	3267.7	3246.6	26,000	33,000	33,000	.....	3264	3265.5	3265.5
Rio Grande.....	Elephant Butte.....	2,638,860	4407	4231.5	1,826,444	1,826,444	1,835,906	.....	4384.2	4384.2	4384.5
Oregon, Umatilla.....	Cold Springs.....	50,000	621.5	560	2,500	10,925	10,925	.....	570.38	586.18	586.18
Oregon-California, Klamath.	Clear Lake.....	462,000	4540	4514	330,000	331,000	331,000	.....	4534.85	4534.91	4534.91
South Dakota, Belle Fourche.	Belle Fourche.....	203,000	2975	2920	83,100	91,960	91,960	.....	2956.5	2958.3	2958.3
Utah, Strawberry Valley....	Strawberry.....	250,000	7558	7514	211,200	216,200	261,520	5,000	7552.6	7533.7	7559.6
Washington:											
Okanogan.....	Conconully.....	14,400	2290	2232	1,740	2,148	2,148	.....	2253.3	2255.4	2255.4
Yakima.....	Bumping Lake.....	34,000	3426	3389	10,445	25,570	30,390	4,820	3401.9	3419.4	3423.4
	Lake Cle Elum.....	22,800	2134	2122	26,055	25,485	42,405	16,920	2135.5	2134.6	2141.6
	Lake Kachess.....	210,000	2258	2192	127,325	171,740	171,740	.....	2230.9	2246.5	2246.5
	Lake Keechelus.....	152,000	2515	2425	51,575	99,705	99,705	.....	2449.7	2491.8	2491.8
Wyoming, Shoshone.....	Shoshone.....	456,600	5360	5132.3	405,884	399,760	405,884	16,663	5352.6	5351.1	5352.2

¹ Or maximum storage.

² Or zero storage.

³ Zero water depth at elevation 1902.2.

⁴ Amount of silt shown by silt survey deducted from original capacity.

⁵ Proposed regulation.

⁶ Estimated low-water limit under proposed plan of regulation.

⁷ Elevation of reservoir raised 12 inches by stop logs in spillway.

SALT RIVER PROJECT, ARIZONA.

Operation and maintenance of irrigation system.--

There was very little demand for irrigation water during December as there was considerable rainfall.

The following maintenance work was accomplished during the month: Miles main canal cleaned, one-fourth; miles laterals cleaned, 19½; old structures repaired, 40; linear feet riprapping (stake and brush banks) built, 883; cubic yards dirt fill placed, 302; cubic yards dry masonry placed, 74; cubic yards concrete placed, 2; tappoons installed and removed in Arizona Canal, 2.

In addition to the above maintenance work, the Ruth dredger bermed 21,520 linear feet of the Grand Canal and moved to Phoenix for a general overhauling on December 21.

The following construction work was performed during December: Cubic yards concrete placed, 14; cubic yards dirt fill placed, 10; cubic yards excavation, 15; linear feet 18-inch concrete pipe installed, 64; linear feet 24-inch concrete pipe installed, 6; linear feet 18-inch corrugated pipe installed, 296; linear feet 24-inch corrugated pipe installed, 192; linear feet 30-inch corrugated pipe installed, 20; redwood headwalls installed, 15; miles pump lateral built, 6.6; still and stringer bridges built, 18; footbridges built, 4; mile fence moved, one-fourth; concrete boxes to wrier boxes of new pumps built, 4.

Work was started on 21 new pump houses, form work being started December 3, and field work December 16.

A contract was let during the early part of the month for the construction of four new zanjero houses. One house at lateral 14½ and Arizona Canal was completed during December.

A crew of six men was started on December 16 fencing the new warehouse and garage property and this work continued during the balance of the month.

Work was continued on widening the Eastern Canal. The Monaghan 2-yard drag line and the Lidgerwood 1½-yard drag line moved 21,290 cubic yards of dirt.

Operation of power system.—The total power generated during the month was 3,225,200 kilowatt hours. The Roosevelt plant operated continuously during the month, generating 1,884,000 kilowatt hours. The Cross Cut plant operated 99 per cent with a total output of 854,500 kilowatt hours. The South Consolidated plant operated 98.4 per cent of the month and generated 264,000 kilowatt hours. The Arizona Falls operated 5.3 per cent, being shut down when water was not available in the Arizona Canal. This plant generated 17,200 kilowatt hours. The Chandler plant operated 92.2 per cent, with a total output of 205,500 kilowatt hours.

The substations all operated without trouble during the month and the pumping plants were all available for service as required.

Construction work—New drainage pumps.—To date the drilling of 10 new drainage wells west of Phoenix has been completed and the drilling of 3 others is under way; 4 wells were completed during December.

Power lines for new pumping plants.—The stringing of the copper wire on power lines for the group of plants west of Phoenix was completed. Seven miles of holes were completed during December and 3 miles of poles erected, guys installed, and railroad crossings completed.

Guy wires for steel towers—40,000-volt lines.—Holes were drilled for anchor bolts and holes dug for soil anchors from Goldfield to Mormon Flats, a distance of 9 miles.—*C. C. Cragin.*

YUMA PROJECT, ARIZONA-CALIFORNIA.

December weather was unusually favorable for alfalfa, which made a good growth. About 2,600 head of cattle were shipped in for pasture during the month. The cotton crop is estimated at 8,000 bales, about 80 per cent of which has been picked.

Construction.—On the South Drain the 30-B Bucyrus advanced 6,400 feet, excavating 31,000 cubic yards of earth. Flumes were built in the Edwards and Cuning laterals and a bridge was completed on the main road in the Gadsden town site. On the East Drain the type 14 Bucyrus advanced 1,200 feet, excavating 8,000 cubic yards, completing the drain on the 11th. The machine was then moved to the East Central Drain, 1 mile west, commencing work at the south end; 1,800 feet of this drain was completed,

with an excavation of 6,500 cubic yards. A bridge was built over the East Drain at Twelfth Street.

Operation and maintenance.—On the Valley Division Ruth dredgers 8 and 9 cleaned 11½ miles of laterals, excavating 16,000 cubic yards of silt. On the Reservation Division Ruth No. 6 worked from the 14th to the end of the month, cleaning 2 miles of lateral and excavating 2,300 cubic yards of silt.

The maximum discharge of the Colorado River was 25,500 second-feet, minimum 5,900 second-feet, total for the month 636,000 acre-feet, for the year 19,464,000 acre-feet. On December 31 the gage height was 19.4, with a discharge of 22,300 second-feet.—*Porter J. Preston.*

MESA DIVISION, YUMA PROJECT.

December weather conditions were ideal for construction work.

At the Mesa Quarry the manufacture of lock-joint pipe was continued; 6,052 linear feet of pipe were cast, sizes 15 to 45 inches. The rock crusher was operated continuously, the rock crushed being used as aggregate for concrete on the different construction features.

At the B Lift pumping plant the construction of the 72-inch force main was continued. The floors of the building were completed. The switchyard installation was carried on and the glazing of the windows and the painting of ironwork in the building was done.

Construction of the minor structures along the lateral system was carried on; 1,600 linear feet of 18-inch pipe line lateral were laid. The pipe was

Preliminary crop report, Orland project, California, 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.			
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.	
Alfalfa hay.....	5,612	Ton.....	23,938	4.2	\$10.00	\$239,380	\$42.65	
Other hay.....	641	do.....	743	1.2	11.00	8,173	12.75	
Corn, sorghum.....	1,939	Bushel.....	85,200	43.8	0.70	59,640	30.80	
Ensilage.....	84	Ton.....	634	7.5	10.00	6,340	75.46	
Barley.....	948	Bushel.....	24,656	26.	0.55	13,561	14.30	
Wheat.....	141	do.....	2,062	14.7	1.00	2,062	14.70	
Almonds.....	760	Pound.....	234,500	308	0.20	46,900	61.70	
Citrus fruits.....	156	Box ¹	7,330	47	3.25	23,832	152.77	
Family orchards.....	159					12,975	81.60	
Prunes (dried).....	182	Pound.....	152,200	838	0.07	10,654	58.60	
Apricots (dried).....	33	do.....	20,500	618	0.15	3,075	93.20	
Peaches (dried).....	22	do.....	8,200		0.085	697	75.00	
Peaches (green).....		do.....	38,000		0.025	950		
Walnuts (English).....	27	do.....	2,000	74	0.25	500	18.50	
Olives.....	3	do.....	16,000	5,330	0.025	400	133.33	
Gardens.....	184					17,760	96.60	
Watermelons.....	88	Ton.....	500	5.7	15.00	7,500	85.20	
Grapes.....	1	do.....	5	5	80.00	400	400.00	
Nursery.....	8					8,400	1,050.00	
Pasture.....	4,247					32,611	7.70	
Less duplicated areas.....	3,785							
Total cropped.....	11,450	Total and average.....					495,810	43.30
Nonbearing orchard.....	1,909	Areas.			Acres.	Farms.	Per cent of project.	
Young alfalfa.....	1,022							
Young vineyards.....	132	Total irrigable area farms reported.....			16,463	663	81.8	
Fall-plowed lands.....	441							
Less duplicated areas.....	254	Total irrigated area farms reported.....			14,700	663	72.9	
		Under water right applications.....						
		Under vested rights.....			14,540	661	72.1	
					160	2	0.8	
Total irrigated.....	14,700	Total cropped area farms reported.....				11,450	663	56.8

¹ Box of oranges weighs 60 pounds.

placed in the trench by the Class 206 drag-line excavator.—*Porter J. Preston.*

ORLAND PROJECT, CALIFORNIA.

Considerable snow fell during December in the Coast Range Mountains, a depth of 8 feet being reported on the summit of Little Stony watershed. With the extremely heavy snowfall the indications are favorable for accumulating full storage at East Park and also for late natural flow of Stony Creek in the summer. About 4,300 acre-feet of storage was diverted from Big Stony Creek and delivered to East Park reservoir by the Feed Canal.

Rainy weather interfered considerably with the progress of concrete lining; 18,434 square yards were placed on 2 miles of laterals. Eight miles of canals and laterals were cleaned and repaired with teams and 24 miles of concrete-lined sections were cleaned by hand.

During December the Orland Unit Water Users' Association discharged in full the sixth annual building installment of the project construction charge. The amount due was \$44,388.63.—*R. C. E. Weber.*

GRAND VALLEY PROJECT, COLORADO.

The weather during December was the mildest experienced in the Grand Valley for 15 years. Rains during the last half of the month caused many of the roads to become nearly impassable, but with this exception conditions were favorable for all kinds of outside work.

The delivery of sugar beets was completed during the month and the plant of the Holly Sugar Co. closed on the 31st after a very successful run. The yield and quality of the beet crop was excellent, but prices were not satisfactory to the grower. Alfalfa hay was bringing about \$7 per ton in the stack, but the demand was light.

The small force of regular employees at the two maintenance camps continued the work of building and installing weirs and other small wooden structures on the lateral system and also performed a small amount of maintenance work on the repair of structures. The P. & H. half-yard drag line completed the excavation of Drain F-2 and began work on Drain E-1. Thirteen hundred and eighty linear feet of drain were completed, involving 7,000 cubic yards of excavation.

The form of proposed contract with the Orchard Mesa Irrigation District was approved by the department on December 22 and submitted to the directors of the district, who have arranged to call an election of the landowners on January 31.—*S. O. Harper.*

UNCOMPAHGRE PROJECT, COLORADO.

December weather conditions were ideal for both construction and operation and maintenance work.

No water was used for irrigation purposes. There was, however, considerable demand for water in the project canals and laterals for stock and domestic purposes.

The P. & H. drag line completed the repairs at the Ironstone extension slides and then moved up and also completed the cleaning work at the sliding section on the main line of the Ironstone Canal at milepost 1.

The tarring of metal flumes on the upper section of the project was completed. The lower section of the 44-inch culvert under the Loutsenhizer Canal at Dry Cedar was replaced. Work was continued on the con-

crete and piling repairs at the Montrose and Delta Canal head works. This work is proceeding in a very satisfactory and economical way. The Fordson tractor recently acquired as a power plant is doing good work in furnishing power for the centrifugal pump and pile driver.

The sluiceway floor of the Ironstone Canal wasteway was repaired with concrete and the necessary repairs to the flume bents of flume No. 4 and the approach section to tunnel No. 3 on the Selig Canal were completed.

Satisfactory progress was made on the construction of the section house at the Big Drop on the Montrose and Delta Canal.

Much spading and brushing was accomplished on the project canals and laterals by ditch-rider crews, and some of these crews were also employed on the placing of riprap on canals and laterals.—*L. J. Foster.*

BOISE PROJECT, IDAHO.

December weather was mild and cloudy.

Labor conditions.—The list of unemployed increased over the preceding month. There is no immediate prospect of employment conditions growing better, as there is little new work in sight.

Farming operations.—Fall plowing was under way until the 15th, when freezing weather prevented further work. Range stockmen have purchased about all the hay that will take care of estimated requirements; sales in the stack ranged from \$3 to \$4 per ton, the latter price predominating. Over 50 per cent of the supply was unsold. Wheat shipments showed a marked increase over the previous month. However, there was still a considerable amount in the hands of the growers.

Water supply.—The streams showed the effect of the heavy rainfall during November, which caused the stream flow to stay about normal. There was not much snow during the month, but reports from the mountains indicated that the snow on the ground was well packed. The storage water in Arrowrock and Deer Flat Reservoirs was greater than the amount for preceding years of the same date.

Operation and maintenance.—A few men were engaged in minor repairs to structures. Water for filling Deer Flat Reservoir was run through the Main Canal until the 18th. After this date the surplus flow of Boise River was held in Arrowrock Reservoir.

Drainage.—The P. & H. drag-line excavator completed the excavation of the Hillyer Drain and was then moved to the Golden Gate Bench, where it began work on the Greenleaf Drain. The Austin drag line continued work on the Drew Drain.

Surveys.—Field surveys and test borings were continued at the site of the proposed Black Canyon Diversion Dam. Office studies were carried on in connection with the Black Canyon and miscellaneous work.—*J. B. Bond.*

KING HILL PROJECT, IDAHO.

The weather as a whole for December was favorable for outside work.

Construction.—Construction of Big Alkali trestle and flume was continued and with the exception of wood-stave barrel was practically completed. Excavation for Camas Road Siphon, Hammett Siphon, and the major portion of King Hill Siphon was completed during the month. Concrete inlet and outlet for Little Alkali Siphon was completed.

At King Hill a total of 3,300 linear feet of lock-joint pipe, ranging from 21 to 54 inches diameter,

was manufactured. At the end of the month the casting of lock-joint pipe was 50 per cent complete; 476 linear feet of pipe were laid in King Hill Siphon.

Operation and maintenance.—Maintenance crew was laid off December 16, on which date they had completed the cleaning of the main canal and about 10 per cent of the lateral system. About 25 per cent of structure repair work remains to be done.

Prevailing crop prices at close of December, 1921.

Project.	Alfalfa hay, per ton.		Barley per bushel.	Oats, per bushel.	Wheat, per bushel.	Potatoes, per bushel.
	In stack.	Baled at ship- ping point.				
Salt River.....	\$8-\$10	\$12-\$14	\$0.70		\$1.30	
Yuma.....	10.00	15.00				
Orland.....	12.00	15.00			.99	
Grand Valley.....	7.00	10.00	.40	\$0.70		\$0.70
Uncompahgre.....	5-10		.55	.33	.78	.75
Boise.....	4.00	8.00	.35	.40	.75	.75
King Hill.....	5.00			.42		1.00
Minidoka.....						
Huntley.....						
Milk River.....			.15	.13	.99	.90
Sun River.....	5.00	10.00	.45	.40	.92	.80
Lower Yellowstone.....	6.50	9.50	.40	.40	1.00	.75
North Platte.....	4.00		.35	.25	.80	.65
Newlands.....	6.00	10.00				1.30
Carlsbad.....		12-15				
Rio Grande.....		15-22		.60	1.20	
North Dakota pumping.....						
Umatilla.....	7.00	11.00				1.20
Klamath.....	4.00	8.00	.53	.37	.88	
Belle Fourche.....	5.00	10.50	.40	.32	.95	1.20
Strawberry Valley.....	6.00	9.00	.50	.33	.60	2.00
Okanogan.....	12.00					1.20
Yakima:						
Sunnyside.....	5-6	7.50-9				.65
Tieton.....	5-6	7.50-9				.65
Riverton.....	5.00	9.00	.38	.30	.80	.60
Shoshone.....	5.00	7.50		.30	.80	.60
Indian projects:						
Blackfoot.....	10.00		.72	.66	.90	
Flathead.....	10.00	14.00		.42	.89	.60
Fort Peck.....				.16	1.00	1.00

Contract work.—Perham & Harris, under a contract with the counties and highway district, completed 40 per cent of the excavation for west abutment of the Glenns Ferry Bridge.—*Walter Ward.*

MINIDOKA PROJECT, IDAHO.

Unusually high temperatures and heavy precipitation characterized the weather during December.

Shipments of farm products amounted to 512 cars, including 212 of sugar beets, 186 of potatoes, 44 of grain and grain products, 23 of live stock, and 45 miscellaneous.

Eleven purchases of right of way were made at American Falls, at a cost of \$8,153.74. The total expenditures to date for this purpose are \$261,124.93. Surveys and computations for the new town site were continued. Surveys of the reservoir were also continued. Studies were made of the canal location on the proposed Mountain Home project.—*Barry Dibble.*

HUNTLEY PROJECT, MONTANA.

Drainage investigations were made in the Turner-Lindberg seepage area. The Austin drag line continued work in cleaning the main canal below Pompeys Pillar until the middle of the month, when cold weather forced a suspension of this work.

Equipment was being overhauled and put in readiness to handle next season's work.—*A. R. McGinness.*

MILK RIVER PROJECT, MONTANA.

December weather was unfavorable for construction and operation and maintenance work.

Surveys.—Topographic survey of the Beaver Creek Flats in the vicinity of Bowdoin was continued during favorable weather. This survey has been completed except for a small amount of work at this point.

Construction by contract.—The contractor for the erection of the buildings at Dodson Dam made good progress.

Construction by Government forces.—Work on the flume for Nelson Reservoir enlargement was in progress when the weather permitted.

Operation and maintenance.—Refilling of the hole below the apron of Dodson Dam was completed. Some of the concrete siphons were pumped out for inspection and repairs. The crop report was completed and work on the annual operation and maintenance report well under way.—*Geo. E. Stratton.*

ST. MARY STORAGE.

December weather was unfavorable for construction work.

A crew was employed making repairs to the lower cylinder gate at Sherburne Lakes Reservoir, the work consisting of filling the spaces in the gate frames behind the cylinder gate where material has lodged preventing closure. When this work was completed all field work was discontinued for the winter and the two camps left in charge of caretakers. The assistant engineer in charge was moved to the project office in Browning for the winter.—*R. M. Snell.*

SUN RIVER PROJECT, MONTANA.

December weather was cold with considerable snowfall.

Construction by Government forces consisted of completing the cattle guards at the outlet ends of the six concrete drops. Earthwork contractors on Greenfields Division were able to work only three or four days during the first half of the month; a storm on the 15th stopped all construction work. Contract was executed with Jenkins Bros. of the earthwork of lateral GS62 and the major part of MC21 and its distributaries.

Farmers baled hay and marketed light shipments of farm produce, shipping out 21 cars of hay and 3 of wheat.—*Geo. O. Sanford.*

LOWER YELLOWSTONE PROJECT, MONTANA-NORTH DAKOTA.

The first two weeks of December were ideal for maintenance and construction work.

From the 1st to the 15th of the month an average of 28 men and 70 head of horses were engaged on schedules 4, 6, 7, 10, 22, 23, 34, 35, 36, 37, and 40, under contract 864.

The operation and maintenance organization was reduced to the minimum and the only maintenance work consisted of cutting brush in the main canal and hauling rock for riprap at the outlet end of the sluice gate at Savage.

A road was constructed leading to the site of the Thomas Point pumping plant and the Monighan drag-line excavator that had been engaged in reinforcing the canal bank below Thomas Point was moved to the

site of the pumping plant in readiness to start excavating there as soon as the piling is received.

The work of making test holes in connection with drainage investigations was completed on the 28th.—*L. H. Mitchell.*

NORTH PLATTE PROJECT, NEBRASKA-WYOMING.

Operation and maintenance.—Valve No. 1 in the South Tunnel of Pathfinder Dam was opened on the 7th to discharge approximately 100 second-feet for use by the city of Casper water supply and oil refineries in that vicinity. This flow was maintained throughout the month.

No water was run in the Interstate Canal system.

Water was diverted into the Fort Laramie Canal for power purposes, the amount varying from 48 to 147 second-feet. Drag line 121247 continued in the excavation of sand below the sand trap in the canal, removing about 9,000 cubic yards during the month.

Drainage.—Drag line No. 122229 was engaged at Minatare Drain Siphon, driving and pulling steel sheet piling, driving piling to support tile racks, and backfilling the completed portion of the siphon. During the month construction forces laid 104 linear feet of 5-foot diameter lock-joint concrete pipe.

Drag line No. 121157 was engaged in the excavation of Dry Spottedtail Outlet.

On the Fort Laramie Division electric drag line No. 131343 continued work on the Katzer Drain between station 78+70 and 105+30; 0.5 mile of drain was completed during the month. Drag line No. 121150 completed the excavation of Grants Drain. There were 1.1 miles of drain constructed on this work.

Construction.—At Pathfinder Dam the remainder of the valve foundations were concreted in place. The

gate leaf, stem, and appurtenances for emergency gate No. 1 were lowered into the canyon on the 31st.

Fort Laramie Division: The three electric drag lines continued operations on the Fort Laramie Canal, completing 1.74 miles of canal.

At the end of the month all work on structures in Upper Cherry Creek Valley had been completed and work by Government forces on the second lateral district was about 84.2 per cent complete.

Northport Division: Drag line No. 121471 continued work on the Northport Canal, excavating 0.43 mile of canal; construction forces continued work on the construction of the lateral system, completing 27 structures. The electric drag line No. 131344, which had been engaged in the construction of the Northport Canal, was transferred to the Shoshone project.

Power system.—The Lingle power plant delivered 5,500 kilowatt hours to Lingle, and 35,500 to Torrington, Wyo., and 12,700 to Morrill and 31,400 to Mitchell, Nebr., during the month.

Surveys.—The field parties engaged in the location of the Table Mountain and Horse Creek lateral systems had located 64 miles of laterals, taken 29 miles of profiles, 18 miles of cross sections, and 4,100 acres of irrigable areas at the end of the month.—*E. F. MacDonald.*

NEWLANDS PROJECT, NEVADA.

December weather was exceedingly variable, ranging from dry, clear, cold weather early in the month to warm, wet weather during the last two weeks. The continuous rains made the roads heavy and outside work was difficult.

The construction of deep open drains was continued. Except for the shutting down of the P. & H. and one

Preliminary crop report, Interstate Division, North Platte project, Nebraska-Wyoming, 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	30,980	Ton.....	53,989	1.7	\$4.50	\$242,950	\$7.84
Alfalfa seed.....	77	Bushel.....	125	1.6	9.00	1,125	14.61
Alfalfa seeding.....	4,919	Saved.....	2,553				
Barley.....	3,413	Bushel.....	100,079	29	.35	35,028	10.26
Beans.....	65	do.....	284	4.4	1.50	426	6.55
Beets, sugar, and tops.....	14,845	Ton.....	166,904	11.2	6.75	1,126,602	75.90
Beef stock.....	5	do.....	96	19	4.00	384	76.80
Clover seed, sweet.....	133	Bushel.....	298	2.2	9.00	2,682	20.16
Corn.....	9,492	do.....	159,765	17	.35	55,918	5.91
Corn fodder.....	117	Ton.....	284	2	2.00	568	4.85
Cucumbers.....	107					4,135	38.64
Garden.....	316					13,037	41.25
Hay (miscellaneous).....	482	Ton.....	490	1	5.00	2,450	5.08
Millet seed.....	229	Bushel.....	1,493	6.7	1.00	1,493	6.52
Oats.....	9,504	do.....	239,359	25	.25	59,840	6.29
Pasture, alfalfa.....	992	Acre.....			6.00	5,952	6.00
Pasture, sweet clover.....	398	do.....			6.00	2,388	6.00
Potatoes.....	9,300	Bushel.....	1,228,963	132	.65	798,826	85.89
Rye.....	454	do.....	2,851	6	.50	1,430	3.15
Wheat.....	4,552	do.....	62,803	14	.75	47,102	10.35
Miscellaneous.....	150					4,584	30.56
Less duplicated areas.....	4,350						
Total cropped.....	86,150	Total and average.....				2,406,920	27.94
Alfalfa seeded with nurse crop.....	4,350						
Alfalfa seeded without nurse crop.....	563						
Fall wheat.....	760						
Fall rye.....	43						
Less duplicated areas.....	4,919						
Total irrigated.....	86,950						
			Areas.	Acres.		Farms.	Per cent of project.
Total irrigable area farms reported.....				108,000		1,340	97
Total irrigated area farms reported.....				86,950		1,340	78
Under water right applications.....				86,350		1,330	77
Under rental contracts.....				600		10	1
Total cropped area farms reported.....				86,150		1,340	78

Bucyrus machine for repairs for about 10 days, five drag-line excavators were in operation on this work, including a Monighan 1 T. Model drag line which started excavation of the Carson Lake Drain on December 14.

Reconstruction of the lower Truckee Canal bank for the section between Lahontan and the Fernley ditch rider's station was completed on December 31 at station 561, using a Monighan drag-line excavator. Other improvement work on this canal was in progress

near Gilpin wasteway, using teams for reinforcing fills and the Austin drag-line excavator for removing slide rock from the concrete-lined sections.

Following completion of the syphon in the Lisle lateral under the Southern Pacific Railroad during November the excavation of this lateral was completed.

The replacing of concrete lining in the Gilpin wasteway tunnel out of the Truckee Canal was completed. Work was commenced on the construction of a camp

Preliminary crop report, Fort Laramie Division, North Platte project, Wyoming, 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	1,353	Ton.....	2,642	2.0	\$4.50	\$11,889	\$8.79
Alfalfa seeding.....	512	Bushel.....	293	293	.35	72	7.21
Barley.....	10	.....do.....	206	21	1.50	22	22.50
Beans.....	1	.....do.....	15	15	6.75	14	51.78
Beets, sugar, and tops.....	817	Ton.....	6,267	7.7	2.00	14	2.80
Cane.....	5	.....do.....	7	1.4	9.00	450	45.00
Clover seed, sweet.....	10	Bushel.....	50	5	.35	5,525	6.44
Corn.....	857	.....do.....	15,785	18	2.00	22	4.40
Corn fodder.....	5	Ton.....	11	2.2	5.00	1,985	5.48
Garden.....	44	Dollar.....	397	1.1	.25	12,200	5.17
Hay (miscellaneous).....	362	Ton.....	397	1.1	6.00	6,450	716.67
Oats.....	2,362	Bushel.....	48,802	21	.65	462	6.00
Onions.....	9	.....do.....	2,150	240	.75	52,966	81.11
Pasture, alfalfa.....	77	Acre.....	81,486	125		49,824	8.96
Potatoes.....	653	Bushel.....	66,434	12		697	38.72
Wheat.....	5,554	.....do.....					
Miscellaneous.....	18	Dollar.....					
Less duplicated areas.....	409						
Total cropped.....	12,240	Total and average.....				188,930	15.43
Alfalfa seeding with nurse crop.....	409						
Alfalfa seeding without nurse crop.....	103						
Fall wheat.....	10						
Less duplicated areas.....	512						
Total irrigated.....	12,250						
		Areas.....			Acres.....	Farms.....	Per cent of project.
		Total irrigable area farms reported.....			14,600	190	15
		Total irrigated area farms reported.....			12,250	190	12
		Under water-right applications.....					
		Under rental contracts.....			12,250	190	12
		Total cropped area farms reported.....			12,240	190	12

Preliminary crop report, North Platte Canal Colonization Co. lands, North Platte project, Wyoming, 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	3,862	Ton.....	7,285	1.9	\$4.50	\$32,782	\$8.50
Barley.....	212	Bushel.....	4,088	19.3	.35	1,432	6.75
Beets, sugar, and tops.....	1,396	Ton.....	15,513	11.1	6.75	104,713	75.01
Cane.....	8	.....do.....	12	1.5	2.00	24	3.00
Corn.....	1,307	Bushel.....	28,941	22.1	.35	10,129	7.75
Hay, other than alfalfa.....	310	Ton.....	160	.5	5.00	800	2.60
Garden.....	44					2,200	50.00
Pasture.....	28					168	6.00
Oats.....	1,536	Bushel.....	30,355	19.8	25.00	7,589	4.94
Potatoes.....	1,634	.....do.....	256,428	157	.65	166,675	102.01
Rye.....	116	.....do.....	1,072	9.2	.50	536	4.62
Wheat.....	435	.....do.....	5,230	12	.75	3,922	9.02
Miscellaneous.....	2					10	5.00
Total cropped.....	10,890	Total and average.....				330,980	30.40
Alfalfa seeding with nurse crop.....	836						
Alfalfa seeding without nurse crop.....	130						
Less duplicated areas.....	836						
Total irrigated.....	11,020						
		Areas.....			Acres.....	Farms.....	Per cent of project.
		Total irrigated farms reported.....			11,020	132	62
		Total cropped area farms reported.....			10,890	132	61

near the Gilpin wasteway for the repair of Truckee Canal Tunnels No. 1 and No. 3.

During the month surveys were made and advertisements and specifications were prepared and issued for the cleaning of laterals. Bids will be opened on January 16 for this work. Twenty-five schedules, including about 42 miles of laterals, are involved. It is anticipated that economy in the performance of maintenance work and the distribution of money to water users where needed to pay operation and maintenance charges will result.

Trees and brush were removed from 1½ miles, 3 miles, and 8 miles of canals and laterals in the Truckee, T, and V Districts, respectively. Ditch riders performed this work. Several minor timber structures were repaired and about 600 square yards of brush riprap was placed in the V District.—*John F. Richardson.*

CARLSBAD PROJECT, NEW MEXICO.

December weather was for the most part fair and unusually warm for the season of the year. The total run-off of the Pecos River at the Dayton station amounted to about 10,000 acre-feet. The flow of the river increased from 170 second-feet at the beginning of the month to about 285 second-feet at the close. McMillan Reservoir was gaining slowly at the end of the month.

Cotton picking was in progress. Practically all of the crop had been ginned at the end of the month, amounting to about 5,400 bales. The bulk of the crop had been sold and shipped, the price ranging from about 12 to 25 cents, depending on grade and staple. Not much high-grade cotton was left to be sold by the middle of the month. A large percentage of the alfalfa hay crop had been disposed of. Shipments made during the month were sold at prices ranging from \$12 to \$15.

Mr. N. H. Darton, geologist of the United States Geological Survey, was on the project from the 11th to 16th, making a geological examination of the proposed Third Reservoir site, Carlsbad Project, and the Red Bluff Reservoir site near the State line. On the 17th Mr. Darton visited the Alamo Gordo Reservoir site, near Fort Sumner, for the purpose of making a geological examination of that site. Mr. Ferd Bonstedt, engineer from the Denver office, arrived on the project the 12th in connection with studies on various reservoir sites on the Pecos River.—*L. E. Foster.*

RIO GRANDE PROJECT, NEW MEXICO-TEXAS.

The weather for December was warm.

Water for irrigation purposes was delivered in the El Paso Division from the 15th to the 30th. Ditch riders were employed collecting crop data, repairing small structures, and making small repairs to structures. Two patrolmen were furnished with traps to catch gophers. They have been catching from 10 to 30 gophers per day. After the gopher is killed the tail is removed and sent to the office as evidence of the number caught by each man. Contracts were let for the removal from canal banks of grass and weeds. Surveys were made and contracts prepared for the annual cleaning. Total yardage to be removed will be about 120,000 cubic yards. From present indications the price per cubic yard will average about 20 cents. The gates were installed for the sand-skimming weir at the head of the Franklin Canal and the concrete wall removed to connect the new intake with the stilling basin.

Requests for water to irrigate lettuce and other garden truck crops during January are being made at Las Cruces.

Construction work at Elephant Butte is practically complete, only a small crew being employed on back-fill against the spillway channel wall and in the extension of the east parapet wall at the east end of the dam. In the Mesilla Valley only one drag-line excavator continued on drainage construction, excavating 0.4 mile of drain. The two Bucyrus excavators and the P. & H. excavator were employed on canal construction during the nonirrigation season, while the Ruth ditch-cleaning machine reconstructed 2½ miles of lateral bank. Of the 6,000 feet of concrete lining under way on the West Side Canal 40 per cent was completed. The Leasburg Canal extension work, including structures, was 60 per cent completed. In the El Paso Valley two Bucyrus excavators and one contract machine continued drainage construction, excavating 41,500 cubic yards in 1.2 miles of drain. Two smaller excavators were employed on canal and lateral work placing 26,100 cubic yards in 1.6 miles of canal. A team crew completed the finishing of the machine-constructed Playa lateral. A small levee and 450 feet of bank protection were placed at the Franklin Feeder Canal heading.—*L. M. Lawson.*

NORTH DAKOTA PUMPING PROJECT.

December weather, although not particularly favorable, did not hamper any work in hand.

All crops of importance were marketed prior to December, so there was no marketing activity.

Some wage reductions were made and cost of work somewhat reduced, particularly that of coal, for which the average cost per ton in 1921 has been reduced about 90 cents below that of 1920.

The power plant was operated for commercial power; 115,000 kilowatt hours of electrical energy were sold to the city of Williston, which is approximately the same load as for the same month last year. The returns will be about \$900 more than for the same month last year.

One thousand one hundred and seven tons of coal were mined.—*Wm. S. Arthur.*

UMATILLA PROJECT, OREGON.

A low mean for temperature and precipitation marked the weather conditions for December.

Fifty-nine cars of baled and chopped alfalfa hay, 2 cars of rye, and 9,625 pounds of honey were shipped during the month.

Farmers on the project, in conjunction with the Hermiston Commercial Club, are in a fair way of having a creamery established here in the near future which, though under private management, will co-operate with the dairymen for mutual benefits. Taken altogether, most farmers are facing the New Year with optimistic outlook.

Operation and maintenance.—Operation of the Feed Canal was continuous till the 19th, when, because of the low temperature, ice formed in the canal so quickly that the head was cut to allow operation of the Echo mill only. The maximum head was 304 and the minimum 26 second-feet during this period. On the 28th water was again diverted for the reservoir and gradually increased to 86 second-feet.

Maintenance work was confined to sluicing of silt from the Main Canal, West Side. On the D line, two to three men were employed part of the month fixing cracks and strengthening collars on the pipe line.

Construction.—East Division: Placing of concrete lining was continued on Canal A until the 3d, when the work was completed to the point set as the objective for the year and all the force except 8 men was discharged. Work on the erection of three timber bridges and construction of a turnout and drop in the A-Maxwell by-pass was started immediately, but the work was hampered by cold weather and work was discontinued on the 15th; 108 cubic yards of concrete lining were placed, one bridge completed, and concrete abutments and pier completed for the second. Forms were built for the structures on the by-pass canal.

West Division: On lateral 12B 382 linear feet of 16-inch concrete pipe were laid.—*H. M. Schilling.*

KLAMATH PROJECT, OREGON-CALIFORNIA.

The weather during the fore part of December was mild and generally favorable for fall work on the farms and for construction.

With the exception of the gate tenders at Clear Lake and at the Lost River Diversion Dam, the operating forces have been layed off for the winter. The diversion canal was operated during the entire month diverting water from Lost River to the Klamath River.

The crop census was completed. The greater portion of the project hay crop was unsold at the end of the month. It is probable, however, that a large part of it will be used during the winter, as sheep and

cattle in large numbers are being fed on the project farms.

One survey party was engaged in connection with the precast flume on the C Canal. The survey party for the lateral system in the Tule Lake Division completed the work and was disbanded on the 10th.

In the Tule Lake Division two drag-line excavators were engaged in the construction of the J Canal and the parallel waste ditch; one drag line was engaged in deepening the No. 10 drain and in constructing a small lateral. The machines were shut down for the winter on the 21st.

On the C Canal the new precast concrete flume has been erected for a distance of 3,000 feet and the old timber flume dismantled for an equal distance. The grouting of the flume joints was discontinued on December 15 on account of cold weather. The inlet and outlet transitions were completed.

On the lower diversion dam on Lost River the contractor has completed all work and the structure has been accepted by the United States.

The California-Oregon Power Co. has completed the construction of the Link River Dam and the channels in the river immediately above the dam. The channel through the reef at the lower end of Upper Klamath Lake has been completed with the exception of removing the cofferdams. The power company began construction of a number of dikes at the northern end of Upper Klamath Lake. The dikes are designed to prevent the overflow of marsh lands owned by the Klamath Indians.—*Herbert D. Newell.*

Comparison between operation and maintenance estimates and results, Jan. 1 to Dec. 31, 1921.

Projects.	Gross cost.			Accruals.			Area which could be irrigated in 1921 (acres).
	Estimate for 1921.	Actual for 1921.	Amount *over or under.	Estimate for 1921.	Actual for 1921.	Amount more or *less than estimate.	
Belle Fourche.....	\$118,500	\$137,000	*\$18,500	\$148,000	\$149,000	\$1,000	82,800
Boise.....	345,000	346,000	*1,000	321,500	356,500	35,000	165,800
Carlsbad.....	50,000	50,200	*200	52,000	56,000	4,000	25,000
Grand Valley.....	60,000	50,200	9,800	61,400	59,200	*2,200	38,350
Huntley.....	75,000	59,000	16,000	88,600	69,000	*19,600	31,300
King Hill.....	29,000	26,700	2,300	29,000	26,700	*2,300	16,000
Klamath.....	75,000	67,300	7,700	87,900	86,500	*1,400	52,500
Lower Yellowstone.....	66,000	56,000	10,000	66,000	56,000	*10,000	38,700
Milk River.....	90,000	85,000	5,000	45,000	14,500	*30,500	*74,500
Minidoka (south side).....	134,000	118,500	15,500	134,000	122,500	*11,500	49,000
Newlands.....	118,700	107,700	11,000	120,600	124,500	3,900	69,300
North Dakota pumping.....	59,050	43,000	16,050	26,800	26,800	.....	7,650
North Platte:							
Interstate.....	275,000	265,000	10,000	342,800	293,000	*49,800	*129,900
Fort Laramie.....	63,000	47,000	16,000	35,000	29,200	*5,800	14,000
Okanogan.....	35,000	43,500	*8,500	41,700	45,500	3,800	8,000
Orland.....	35,000	37,800	*2,800	41,200	41,800	600	20,500
Rio Grande.....	242,500	235,000	7,500	249,000	214,000	*35,000	118,000
Shoshone.....	108,600	86,000	22,600	126,000	125,000	*1,000	65,800
Strawberry Valley.....	30,000	24,800	5,200	60,000	67,500	7,500	59,100
Sun River:							
Fort Shaw.....	20,000	17,300	2,700	26,400	26,800	400	12,200
Greenfields.....	40,000	38,200	1,800	15,000	22,000	7,000	25,100
Umatilla.....	53,000	45,000	8,000	53,000	52,200	*800	26,300
Uncompahgre.....	145,000	149,000	*4,000	152,300	152,300	.....	100,000
Yakima:							
Sunny Side.....	135,000	137,000	*2,000	150,500	151,000	500	110,800
Tieton.....	92,000	92,000	.....	103,200	105,500	2,300	32,000
Yuma.....	233,000	332,000	*99,000	300,000	260,000	*40,000	61,300
Total.....	2,727,350	2,696,200	31,150	2,877,200	2,733,000	*144,200	1,433,900

¹ Figures estimated; report not received from project in time for publication.

² Accruals taken same as probable actual costs for 1921, although contracts provide for return of operation and maintenance deficits for 1919 and 1920 in addition to actual costs for 1921.

³ Stored water is furnished through St. Mary Canal for 21,600 acres additional.

⁴ Includes 17,000 acres for which water is carried in main canal.

⁵ Does not include Strawberry Tunnel repairs.

BELLE FOURCHE PROJECT, SOUTH DAKOTA.

The first half of December was open and warm.

The feeder canal was in operation continuously. The maximum flow was 156 second-feet and the minimum 76 second-feet. The accretion to storage was 8,337 acre-feet. The foremen at Orman, Vale, and Newell were engaged on odd jobs and equipment repairs. The garage man was employed in the shop, working over automobiles and other equipment.

Surveys were made of a number of coulees which will be used for wasteway channels, and some work was done on irrigable area determination.

The only movement of crops was a few carloads of alfalfa shipped to Black Hills towns and an occasional load of wheat sold at the elevator. The setting in of winter weather necessitated rather heavy feeding of stock. Little outside stock had been brought to the project for feeding. A few bands of lambs were being fattened and some had been shipped. The price received was 9½ to 10½ cents, which is a good price considering the fact that the lambs were bought at 5 cents and that hay was worth only \$4 to \$6 per ton in the stack.—*B. E. Hayden.*

STRAWBERRY VALLEY PROJECT, UTAH.

December was generally mild, with abnormal precipitation.

Farming operations.—Farming operations practically ceased during the month. Extremely mild and open weather conditions enabled most of the fall plowing to be completed and materially aided the grazing of live stock on the project farms.

No shipments of hay or grain to outside points were reported, and only a few shipments of live stock were made to Pacific coast points.

Sugar-beet factories continued in operation.

Operation and maintenance, storage system.—Operations at West Portal Camp on repairs to Strawberry Tunnel were continued. Altogether 15 bays and 2,700 linear feet of new floor were put in between stations 85+00 and 112+00.

Operation and maintenance, power system.—The power plant was operated without serious interruption throughout the month, and power furnished to the towns of Spanish Fork, Payson, Springville, and Salem.

Collection of the construction and operation and maintenance charges during December aggregated \$19,560, and on the last day of the month approximately 51 per cent of the collections had been made.

Conference was held in Provo, on December 19, between officials of the Reclamation Service and representatives of the Strawberry Water Users' Association, relative to taking over the operation and maintenance of the project by the water users.—*W. L. Whittemore.*

OKANOGAN PROJECT, WASHINGTON.

December weather was practically normal, with very little precipitation.

A foreman and master mechanic and one helper were busy throughout the early part of the month in storing and repairing machinery and making repairs to the project telephone lines. During the last of the month the foreman was at Conconully in charge of a crew of men completing Salmon Lake road in order to make it acceptable to the board of county commissioners. During the last part of the month the master mechanic and one helper were

employed in making repairs to machinery and in some minor repairs to the shop and turning out some blacksmith work made necessary by the proposed moving of the remainder of the steam shovel from Conconully to Omak.—*Calvin Casteel.*

YAKIMA PROJECT, WASHINGTON.

December temperature was below normal and precipitation above normal.

Maintenance, Sunnyside Division.—Maintenance work consisted of sloping of canal banks for gravel riprap where excessive erosion had occurred along the main canal, trimming of overhanging berms, grubbing of willows, and replacement and repair of structures in the distribution system. High water in the Yakima River necessitated some protective work at the main canal headworks. Maintenance crews were laid off about the 18th, when severe weather interfered with prosecution of the work. The Outlook and Grandview pumping plants were dismantled and inspected.

Maintenance, Tieton Division.—Maintenance work consisted of minor repairs on the main canal, removal of silt from main laterals and repair and replacement of structures on main and sublaterals, grubbing willows, and maintaining telephone line. Two maintenance crews of five men each were engaged on betterment work on the sublateral system, consisting of replacement of concrete pipe lines and small wooden flumes. Flood water in Covich Creek permitted run of water in the canals for filling cisterns for a five-day period starting December 12.

Storage reservoirs.—Keechelus and Kachess Reservoirs were closed throughout the month, and during the flood period from the 10th to 15th considerable water was stored in these reservoirs. At Cle Elum the water passed over the spillway during the entire month. At Bumping Lake the gates were operated for a short time to furnish water to Pacific Power & Light Co., but for the greater part of the month were operated to hold the lake surface down.—*J. L. Lytel.*

TIETON DAM.

Heavy snows in December followed by warm winds and rain interfered seriously with construction operations at the Tieton Dam. On the first of the month there were 16 inches of snow on the ground, all of which melted from the 10th to the 13th. At the end of the month snow had again fallen to a depth of 13 inches. From the 1st to the 10th the principal work was on core-wall excavation and construction of diversion dam, road excavation, cableway construction, and the construction of dinkey tracks and moving of shovels for next year's operations. The latter part of the month was taken up with repairs and replacement of diversion dam and power flume.—*F. T. Croyce.*

RIVERTON PROJECT, WYOMING.

Three drag lines were excavating from the Wyoming Canal. The total amount of material excavated was 71,600 cubic yards, all of which was excavated from the canal prism. Of this material 53,381 cubic yards was class 1 material, sandy loam; 16,449 cubic yards was shale and soft sandstone; and 1,770 cubic yards was a rather hard sandstone.

At the Wind River Diversion Dam excavation of the cut-off trench below the sluiceway and logway was completed. The amount of material moved was 600 cubic yards of gravel and 86 cubic yards of sand-

stone, all of which was excavated by hand. Concrete was placed in the sluiceway piers and the first section of the weir, 40 feet in length, was completed. Five hundred and eighteen cubic yards of plain concrete and 28 cubic yards of reinforced concrete were placed. On December 17 the river was suddenly blocked by an ice jam and the cofferdam was filled with water. At the end of the month the cofferdam had again been unwatered and strengthened and the material washed in had been partly removed. The clearing of trees and stumps from the site of the dike was nearly completed, and stripping the unsuitable material from the site of the dike was begun on December 30.

One survey party was employed at Pavillion on main canal location and on investigations.—*H. D. Comstock.*

SHOSHONE PROJECT, WYOMING.

During the first half of December temperatures and weather conditions were above the average. During

the last half of the month numerous snow squalls hindered outdoor work and road traffic.

Water supply.—The Shoshone River was at a low stage the entire month and the water surface in Shoshone Reservoir dropped 1½ feet during the month.

Operation and maintenance.—The principal maintenance work during the month consisted of cleaning a number of tile drains where they had become clogged with willow roots and the replacing of a number of wooden manholes which were in a damaged condition because of decay of the wood.

Crops.—The principal work on the farms was in connection with baling and shipping hay. The alfalfa mills at Powell and Garland did not operate the entire month because of bad weather. The following shipments were made from the project during the month: Alfalfa meal, 21 cars; alfalfa hay, 161 cars; wheat, 2 cars; potatoes, 5 cars; clover seed, 2 cars. The clover seed was seed held over from the 1920 crop.

Drainage.—The following tabulation shows the progress of drainage excavation during the month:

Drainage work on the Garland and Frannie Divisions.

Machine.	No. and size of bucket.	Area.	Linear feet.	Cubic yards.	Shifts.	Cubic yards per shift.
Bucyrus gas 9½.....	121324; 1½-yard bucket.....	North Garland.....	3,960	25,492	29	880
Lidgerwood.....	113210; 1-yard bucket.....	South Garland.....	1,630	10,469	23	455
Bucyrus gas 1½.....	121475; 2½-yard bucket.....	Frannie Drain 105.....	900	28,625	57	502
Do.....	121472.....	North Garland.....	300	2,046	3	658

Due to weather conditions, the various machines were closed down from the 2d to the 17th, except the class 14 Bucyrus gasoline drag line working on surface drain 105, which is still in operation.

Field and office engineering.—One crew was engaged the entire month upon supplemental surveys on the

Willwood Division. One crew on the Garland Division and one crew on the Frannie Division were engaged principally upon drainage investigation work and work in connection with drainage construction. The former crew also did some work on transmission-line location. Office work was principally in connection

Preliminary crop report, Frannie Division, Shoshone project, 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	18,160	Ton.....	32,920.00	1.81	\$5.00	\$164,600	\$9.07
Alfalfa seed.....	66	Bushel.....	9.00	.14	3.60	32	.49
Barley.....	166	do.....	4,744.00	28.49	.40	1,898	11.39
Beets, sugar.....	1,508	Ton.....	14,684.00	9.74	7.00	102,788	68.16
Clover hay.....	18	do.....	18.00	1.00	5.00	90	5.00
Clover seed.....	657	Bushel.....	611.00	.93	3.00	1,833	2.79
Corn.....	46	do.....	1,014.00	21.69	.40	406	8.64
Garden.....	267	Acre.....	.....	.....	.....	19,365	72.47
Oats.....	2,579	Bushel.....	65,219.00	25.28	.32	20,870	8.00
Oat hay.....	298	Ton.....	186.00	.62	4.00	744	2.40
Pasture.....	2,338	Acre.....	.....	.....	.....	18,077	7.72
Potatoes.....	1,820	Bushel.....	307,323.00	168.81	.60	184,394	101.20
Rye.....	20	do.....	100.00	5.00	1.00	100	5.00
Wheat.....	6,204	do.....	137,685.00	22.19	.85	117,032	18.87
Miscellaneous ¹	23	.....	.....	.....	.....	1,231	.....
Total cropped.....	34,170	Total and average.....	.....	.....	.....	633,460	18.54
Nonbearing orchard.....	62	.....	.....	.....	.....	.....	.....
Young alfalfa.....	861	.....	.....	.....	.....	.....	.....
Ground fall-plowed.....	57	.....	.....	.....	.....	.....	.....
Miscellaneous.....	102	.....	.....	.....	.....	.....	.....
Less duplicated areas.....	682	.....	.....	.....	.....	.....	.....
Total irrigated.....	34,570	.....	.....	.....	.....	.....	.....
		Areas.			Acres.	Farms.	
		Total irrigable area farms reported.....			41,625	653	
		Total irrigated area farms reported.....			34,570	653	
		Under water right applications.....			34,015	646	
		Water right in litigation.....			555	7	
		Total cropped area farms reported.....			34,174	653	

¹ Apples, beans, corn fodder, small fruits, millet seed, and onions.

with the power-plant and transmission-line construction, but a considerable amount of work was also done on the collection and tabulation of data for a board which began meeting on the 30th of the month to formulate plans for the 1922 drainage work.

Construction.—At Shoshone Dam the principal work was on the erection of the steel roof trusses in the power house, the placing and concreting in of the semi-steel tunnel linings at the transitions of the steel sections of the penstock to the tunnel section, the construction of the by-pass house, and work on the cofferdam at the base of the dam. Three hundred and sixty yards of concrete and 63 cubic yards of rock masonry were placed and 105,000 pounds of structural steel were erected. The turbines for the first and second units were also placed.

Settlement.—The Garland Division Water Users' Association held their annual meeting on December 29. The principal object of discussion was the question of the formation of an irrigation district embracing the Garland Division only. The meeting favored such a course of action.—*J. S. Longwell.*

INDIAN PROJECTS, MONTANA.

BLACKFEET PROJECT.

December weather conditions were unfavorable for construction work.

Construction work consisted of building 3 miles of telephone line on Fisher Flats and remodeling the timber outlet works and placing cast-iron gates at Four Horns Reservoir. The only farm work consisted of a small amount of thrashing and hauling grain to market. Several of the larger crops on the Badger-Fisher Division were being held for higher prices, but a large per cent of the crops had already been marketed.—*R. M. Snell.*

FLATHEAD PROJECT, MONTANA.

December weather conditions were good.

Work under contract No. 858, lining of Dry Creek Canal, was discontinued on December 23 except for cement hauling by local teams. Gravel and sand had been delivered from stations 100 to 157, leaving the part between stations 66 and 100 to be supplied in the spring season. On account of freezing of the gravel pit, further work on the gravel haul was not profitable. The contract was 62.5 per cent completed.

Live-stock conditions were good. There was plenty of hay on hand for wintering stock.—*C. J. Moody.*

FORT PECK PROJECT, MONTANA.

No construction work was in progress, camps being in charge of caretakers.

Range conditions were favorable, the snowfall to date having been light. After the 18th, however, colder weather made considerable feeding necessary.—*S. A. Kerr.*

GENERAL OFFICES.

Washington office.—Director Davis returned to the office on December 24, after attending, in company with Secretary Fall, the meeting of the League of the Southwest at Riverside, Calif., on December 8, and the hearing at San Diego, on December 12 and 13, on the Colorado River development. Shortly after his return the director attended the hearings of the House Committee on Appropriations in connection with the estimates of appropriations for the Reclamation Service.

During the absence of the director the office was in charge of Assistant Director Morris Bien as acting director.

Preliminary crop report, Garland Division, Shoshone project, 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	4,228	Ton.....	8,055	1.91	\$5.00	\$40,275	\$9.53
Alfalfa seed.....	87	Bushel.....	53	.61	3.60	191	2.19
Barley.....	97	do.....	742	7.63	.40	297	3.06
Beets, sugar.....	43	Ton.....	247	5.68	7.00	1,729	39.75
Clover hay.....	258	do.....	245	.95	5.00	1,225	4.75
Clover seed.....	644	Bushel.....	1,222	1.90	3.00	3,666	5.70
Corn.....	74	do.....	520	7.00	.40	208	2.81
Corn fodder.....	17	Ton.....	10	.59	3.00	30	1.76
Flax.....	49	Bushel.....	120	2.45	1.30	156	3.18
Garden.....	60	Acre.....				3,782	63.39
Millet seed.....	3	Bushel.....	12	4.00	3.60	43	14.40
Oats.....	1,205	do.....	14,284	1,185	.32	4,571	3.79
Oat hay.....	117	Ton.....	116	.99	4.00	464	3.97
Pasture.....	931	Acre.....				3,665	3.94
Potatoes.....	141	Bushel.....	9,872	69.78	.60	5,923	41.87
Rye.....	8	do.....	32	4.00	1.00	32	4.00
Wheat.....	1,748	do.....	15,088	8.63	.85	12,825	7.34
Total cropped.....	9,710	Total and average.....				79,080	8.15
Nonbearing orchard.....	6						
Young alfalfa.....	1,280						
Ground fall-plowed.....	711						
Miscellaneous.....	485						
Other purposes.....	1,144						
Less duplicated areas.....	1,342						
Total irrigated.....	10,850						
		Areas.			Acres.	Farms.	
		Total irrigable area farms reported.....			19,578	281	
		Total irrigable area farms reported.....			10,850	281	
		Under water-right applications.....			10,785	277	
		Under rental contracts.....			65	4	
		Total cropped area farms reported.....			9,710	281	

Chief Counsel Hamele was in the office the entire month.

Summary of employees for December, 1921.

Projects.	Begin- ning of month.	End of month.	In- crease.	De- crease.
Washington office.....	85	84	.....	1
Denver office.....	77	74	.....	3
Field legal.....	24	23	.....	1
Examiners of accounts.....	3	3	.....	.....
Yuma.....	128	127	.....	1
Yuma auxiliary.....	110	132	22	.....
Orland.....	63	70	7	.....
Grand Valley.....	27	27	.....	.....
Uncompahgre Valley.....	96	92	.....	4
Boise.....	95	67	.....	28
King Hill.....	94	93	.....	1
Minidoka.....	91	87	.....	4
Huntley.....	9	9	.....	.....
Lower Yellowstone.....	23	17	.....	6
Milk River.....	66	51	.....	15
St. Mary storage (including one-half time of 7 to 8 employees on Blackfeet project).....	13	10	.....	8
Sun River.....	32	26	.....	6
North Platte.....	395	312	.....	83
Newlands.....	124	120	.....	4
Carlsbad.....	12	14	2	.....
Rio Grande.....	350	500	150	.....
Umatilla.....	50	25	.....	25
Klamath.....	136	64	.....	72
North Dakota pumping.....	25	22	.....	3
Belle Fourche.....	20	15	.....	5
Strawberry Valley.....	52	51	.....	1
Okanogan.....	10	11	1	.....
Yakima.....	106	85	.....	21
Tieton Dam.....	173	170	.....	3
Riverton.....	101	80	.....	21
Shoshone.....	296	296	.....	.....
Blackfeet (exclusive of one-half time of 7 to 8 employees on St. Mary stor- age project).....	6	.....	.....	6
Flathead.....	50	33	.....	17
Fort Peck.....	5	5	.....	.....
Unassigned per diem.....	37	37	.....	.....
Secondary.....	46	34	.....	12
Total employees.....	3,025	2,856	.....	.....
Increase.....	.....	.....	182	.....
Decrease.....	.....	.....	.....	351
Net decrease.....	.....	.....	.....	169

Action was taken by the Secretary on the following matters submitted to him:

Reporting adversely on bill S. 2586, to allow a single individual who has paid the construction charge in full on one farm unit to thereafter acquire as large an area as he may desire without reference to whether construction charges on the latter are paid; signed December 6.

Recommending approval, as to form, of draft of contract with the Grand Valley Water Users' Association and the Orchard Mesa Irrigation District, providing for the reconstruction of the Orchard Mesa project as a part of the Grand Valley project; approved December 16.

Reporting favorably, with suggested amendments, of bill S. 2747, to encourage the development of the agricultural resources of the United States through Federal and State cooperation; signed December 28.

Requesting authority to publish the RECLAMATION RECORD as an administrative and statistical report of the operations of the Service, under the special regulations of the Joint Committee on Printing of December 21; approved December 29.

Requesting approval of a reduction in the operation and maintenance charges for 1921 on the Huntley project; approved December 29.

Recommending execution of a contract with the Imperial Irrigation District of California under which the district will advance \$30,000 to continue the investigation of Boulder Canyon; approved December 29.

Denver office.—Chief Engineer Weymouth returned to Denver on December 3 from a field trip. On December 13 he left for Pendleton, Oreg., to address the Oregon Drainage Congress, returning to Denver on the 19th. Assistant Chief Engineer Walter left on December 5 for a visit to the Uncompahgre, Grand Valley, and Strawberry Valley projects, returning to Denver on the 20th. Assistant Chief Engineer Williams was in the Denver office during the entire month.

The principal work accomplished in the designing division during the month consisted of the preparation of designs and estimates for miscellaneous structures, Willow Creek Canal, Belle Fourche project; advertisement and specifications for gates and lifts, Carlsbad project; a review of designs submitted by city of Los Angeles relative to Boulder Canyon and Black Canyon Dam, Colorado River storage project; advertisement for purchase of reinforcing steel, Dry Creek Canal lining, Flathead project; design and specifications for culverts under J Canal, Klamath project; designs for tunnel repairs, Truckee Canal, Newlands project; designs for siphons on Fort Laramie and Enterprise Canals and for miscellaneous structures, North Platte project; estimate for East Fork Reservoir outlet works, Orland project; a review of Bond's report and designs, Owyhee secondary project; estimates for canal lining and checks and designs for Pilot Butte lined canal, Riverton project; estimates and detail designs for Willwood Canal and diversion dam, Shoshone project; details for retaining wall, American Falls Dam abutment, Snake River storage project; designs and advertisement for siphon and miscellaneous structures, Sun River project; map and estimate for domestic water supply system and land classification map, Uncompahgre project; comparative estimates for diversion dam and Casteel Reservoir, Saratoga-Encampment secondary project; spillway design and drawings for Tieton Dam and advertisement for purchase of wood-stave pipe, Yakima project; advertisement for diamond drilling at various reservoir sites, Pecos River secondary project; a review of Snell's report on proposed Cut Bank secondary project. Work was continued on tracings and drawings in connection with standardization of lock-joint concrete pipe forms and precast structures. Inspection was made of materials purchased under six Denver office advertisements.

The principal work accomplished in the electrical division during the month consisted of preparation of a general plan for Thomas Point pumping plant and foundation drawings, Lower Yellowstone project; a revision of draft of Rural Safety Code, covering construction and maintenance of rural electric lines, Minidoka project; an estimate of returns from commercial power contract, North Dakota pumping; estimates for proposed extension to Fort Laramie pumping units, North Platte project; details of dead-end structure for transmission line and miscellaneous structures in connection with power plant, Shoshone project; specifications for pumps and motors and general plans for improvement of class 14 Bucyrus drag-line, Yuma project; a review of estimates for power and pumping plants, Owyhee secondary project; a review of plans for outlets and estimates of power development, Boulder Canyon and Black Canyon Dams, Colorado River secondary project.—F. E. Weymouth.

ADMINISTRATIVE ORGANIZATION.

DEPARTMENT OF THE INTERIOR.

Hon. ALBERT B. FALL, Secretary of the Interior.
 EDWARD C. FINNEY, First Assistant Secretary.
 FRANCIS M. GOODWIN, Assistant Secretary.
 EDWIN S. BOOTH, Solicitor for the Interior Department.
 CHARLES V. SAFFORD, Administrative Assistant to the Secretary.
 CHARLES W. NESTLER, Administrative Assistant to the Secretary.
 HARRY G. CLUNN, Private Secretary to the Secretary.
 JOHN HARVEY, Chief Clerk and Superintendent of Buildings.

U. S. RECLAMATION SERVICE.

WASHINGTON, D. C.

Arthur Powell Davis, director; Morris Bien, assistant director; Ottamar Hamele, chief counsel; J. B. Beadle, director's assistant; C. J. Blanchard, statistician; Hugh A. Brown, editor and office assistant; C. A. Bissell, engineer; C. A. Lyman, acting chief accountant; Miss H. A. Fellows and Raymond Depue, fiscal agents; C. H. Fitch, chief clerk; Emmet Carr, purchasing agent; G. W. Numbers, appointment clerk; H. N. Bickel, Yakima, Wash.; W. A. Meyer, Denver, Colo., and W. F. Kubach, Great Falls, Mont., examiners of accounts.

DENVER, COLO.

F. E. Weymouth, chief engineer, Tramway Building, Denver, Colo.; R. F. Walter and C. P. Williams, assistant chief engineers; Miss L. H. Melsel, secretary to the chief engineer; J. M. Gaylord, electrical engineer; J. L. Savage, designing engineer; James Munn, engineer; J. L. Burkholder, drainage engineer; W. L. Drager, office engineer; J. M. Luney, chief clerk; A. McD. Brooks, purchasing agent; Harry Caden, special fiscal agent.

FIELD LEGAL OFFICES.

Boise, Idaho.—B. E. Stoutemyer, district counsel. Projects: Boise, Minidoka, King Hill, and Jackson Lake Enlargement; R. M. Patrick, district counsel, located at American Falls, Idaho.

Denver, Colo.—Law section office of chief engineer; E. E. Roddis and Armand Offutt, district counsel.

El Paso, Tex.—P. W. Dent, district counsel. Projects: Rio Grande, Carlsbad, and Hondo.

Las Cruces, N. Mex.—Mark B. Thompson, attorney in charge of litigation on Rio Grande and Carlsbad projects.

Helena, Mont.—W. J. Egleston, district counsel, Helena, Mont. Projects: Blackfoot, Flathead, Fort Peck, Huntley, Milk River, St. Mary Storage, Sun River, North Dakota Pumping, Lower Yellowstone, and Shoshone.

Mitchell, Nebr.—J. N. Beardslee, district counsel. Projects: North Platte and Belle Fourche.

Montrose, Colo.—J. R. Alexander, district counsel. Projects: Grand Valley, Uncompahgre, and Strawberry Valley.

Portland, Oreg.—H. L. Holgate and D. G. Tyree, district counsel. Projects: Yakima, Okanogan, Umatilla, and Klamath.

San Francisco, Calif.—Henry A. Cox and A. B. Fullerton, district counsel, 349 Pacific Building. Projects: Salt River, Yuma, Orland, and Newlands.

PROJECT ORGANIZATION.

Belle Fourche Project.—B. E. Hayden, project manager, Newell, S. Dak.; R. C. Walber, chief clerk; August Lewin, fiscal agent.

Boise Project.—J. B. Bond, project manager, Boise, Idaho; E. R. Mills, chief clerk; C. F. Weinkauff, fiscal agent.

Carlsbad Project.—L. E. Foster, project manager, Carlsbad, N. Mex.; V. L. Minter, chief clerk and fiscal agent.

Grand Valley Project.—S. O. Harper, project manager, Grand Junction, Colo.; G. H. Murphy, chief clerk; A. H. Hall, fiscal agent.

Huntley Project.—A. R. McGinness, project manager, Ballantine, Mont.; G. H. Bolt, chief clerk; Miss M. C. Simek, fiscal agent.

King Hill Project.—Walter Ward, project manager, King Hill, Idaho; T. W. Hause, chief clerk; L. D. Eakin, fiscal agent.

Klamath Project.—H. D. Newell, project manager, Klamath Falls, Oreg.; N. G. Wheeler, chief clerk; G. R. Barnhart, fiscal agent.

Lower Yellowstone Project.—L. H. Mitchell, project manager, Savage, Mont.; C. A. Denman, chief clerk.

Milk River Project.—G. E. Stratton, project manager, Malta, Mont.; H. A. Parker, engineer; E. E. Chabot, chief clerk; G. S. Moore, fiscal agent.

Minidoka Project.—Barry Dibble, project manager, Burley, Idaho; Dana Templin, engineer; E. C. Diehl, chief clerk; Miss A. J. Larson, fiscal agent; F. A. Banks, engineer, American Falls, Idaho.

Newlands Project.—J. F. Richardson, project manager, Fallon, Nev.; A. W. Walker, engineer; G. B. Snow, chief clerk and fiscal agent.

North Dakota Pumping Project.—W. S. Arthur, project manager and chief clerk, Williston, N. Dak.; H. C. Melas, fiscal agent.

North Platte Project.—Andrew Weiss, project manager, Mitchell, Nebr.; H. W. Bashore, engineer, Fort Laramie Division; Paul Rothi, irrigation manager; J. R. Ummel, chief clerk; Miss A. L. Perrine, fiscal agent.

Okanogan Project.—Calvin Casteel, project manager, Okanogan, Wash.; W. D. Funk, chief clerk and fiscal agent.

Orland Project.—R. C. E. Weber, project manager, Orland, Calif.; E. T. Eriksen, engineer; C. H. Lillingston, chief clerk and fiscal agent.

Rio Grand Project.—L. M. Lawson, project manager, El Paso, Tex.; T. W. Parry, irrigation manager; C. A. Peavey, chief clerk; L. S. Kennicott, fiscal agent.

Riverton Project.—H. D. Comstock, project manager, Riverton, Wyo.; R. M. Conner, engineer; G. H. Baird, chief clerk; J. C. Thraillkill, fiscal agent.

St. Mary Storage Division.—R. M. Snell, project manager, Brownling, Mont.; F. H. Shiner, chief clerk; H. E. Bruce, fiscal agent.

Salt River Project.—Being operated by the Salt River Valley Water Users' Association; C. C. Cragin, general superintendent and chief engineer, Phoenix, Ariz.

Shoshone Project.—J. S. Longwell, project manager, Powell, Wyo.; J. R. Iakisch, engineer; C. M. Jump, superintendent of irrigation; W. F. Sha, chief clerk; Miss L. C. Drinkwater, fiscal agent.

Strawberry Valley Project.—W. L. Whittemore, project manager, Provo, Utah; J. E. Overlade, chief clerk and fiscal agent.

Sun River Project.—G. O. Sanford, project manager, Great Falls, Mont.; H. W. Johnson, chief clerk; Miss M. G. Valentine, fiscal agent; G. A. Benjamin, irrigation manager, Fairfield, Mont.

Umatilla Project.—H. M. Schilling, project manager, Hermiston, Oreg.; M. D. Scroggs, superintendent of irrigation; G. C. Patterson, chief clerk and fiscal agent.

Uncompahgre Project.—L. J. Foster, project manager, Montrose, Colo.; A. H. Peach, chief clerk and fiscal agent.

Yakima Project.—J. L. Lytel, project manager, Yakima, Wash.; R. K. Cunningham, chief clerk; J. C. Gawler, fiscal agent; M. D. Scroggs, superintendent of irrigation, Sunny-side, Wash.; J. S. Moore, superintendent of irrigation, Route 6, Yakima, Wash.; F. T. Crowe, engineer in charge construction Tieton Dam, Rlmrock, Wash.; C. E. Crownover and C. F. Gleason, engineers; V. G. Evans, chief clerk; C. B. Funk, fiscal agent.

Yuma Project.—P. J. Preston, project manager, Yuma, Ariz.; R. M. Priest, superintendent of construction; S. A. McWilliams, engineer, Yuma Mesa Division; E. R. Scheppelmann, chief clerk; E. M. Philebaum, fiscal agent.

INDIAN PROJECTS.

Blackfoot Project.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk and fiscal agent.

Flathead Project.—C. J. Moody, project manager, St. Ignatus, Mont.; J. M. Swan, chief clerk; J. P. Siebeneicher, fiscal agent.

Fort Peck Project.—S. A. Kerr, project manager, Poplar, Mont.; Henry Berryhill, chief clerk and fiscal agent.

The Reclamation Record

An ADMINISTRATIVE and STATISTICAL REPORT

Issued Monthly by the RECLAMATION SERVICE, DEPARTMENT OF THE INTERIOR, Washington, D. C.

CERTIFICATE: By direction of the Secretary of the Interior the matter contained herein is published as administrative information and is required for the proper transaction of the public business.

VOLUME 13, No. 2

FEBRUARY, 1922

REPORT ON THE BOUNDARY DRAINAGE PUMPING PLANT, YUMA PROJECT.

THE Boundary Drainage Pumping Plant is located practically on the boundary line between the United States and Mexico, about 26 miles south of Yuma, Ariz., and 1 mile east of the Colorado River. It is used for pumping drainage water from approximately 50,000 acres of land. Supplies are carried by rail direct to the plant, the cost of transportation at regular rates being included in the table of costs.

The building is a reinforced concrete structure built into the levee, with door and window sills $7\frac{1}{2}$ feet above the operating floor, arranged so that in case of a break in the levee, with consequent flooding of the low lands, the plant can still be operated.

The present pumping equipment consists of one 36-inch Wood screw pump, with a normal capacity of about 60 second-feet, direct connected to a 100-horsepower Fairbanks-Morse & Co. type Y semi-Diesel oil engine, and one 30-inch Wood screw pump, normal capacity 30 second-feet, direct connected to a 75-horsepower oil engine. Auxiliary equipment is provided for starting the main units, consisting of one air compressor, one $2\frac{1}{2}$ -inch centrifugal pump, and two vacuum pumps, connected by belts to a line shaft driven by a 10-horsepower oil engine.

California crude oil, from 24° to 27° Baumé, is used for fuel, and is stored in a 20,000-gallon horizontal cylindrical tank. Fuel consumption is determined from tables giving the computed capacity of the tank for each inch in depth.

Foundations and discharge pipes are already constructed for two additional pumping units, similar to the larger unit now installed, and conduits for wires are installed to permit connection of electric motors to all pumps whenever electric power is available.

Water flows by gravity through drain canals to the pumping station, and is there pumped through the levee and discharged into the Colorado River. The lift is variable, both on account of the variation in the elevation of river water surface at different seasons of the year and because the pumps are operated normally but a portion of each day, allowing the water to accumulate in the forebay.

The discharge measurements are based on the capacity of the pumps as determined by a test run. The lift at the beginning and at the end of the day's run is measured and the mean of the two measurements is taken as the average lift; with this figure given, the discharge is taken from the curve. Al-

Field cost, Boundary pumping plant, fiscal year 1921.

	Operation.			Repairs to machinery.		Minor equipment repairs and supplies.	Minor miscellaneous expenses.	Equip-ment.	Cost.		
	Labor.	Fuel.	Lubri-cants.	Labor.	Materials and supplies.				Total.	Per acre-foot.	Per foot acre-foot.
July.....	\$325.00	\$177.05	\$50.00	\$15.95	\$2.10	\$86.21	\$2.23	\$20.00	\$678.54	\$0.318	\$0.032
August.....	325.00	334.88	25.00	140.40	375.18	37.45	.....	20.00	1,257.91	.572	.059
September.....	325.00	221.61	50.00	2.73	.08	362.95	.....	20.00	982.37	.440	.047
October.....	325.00	181.32	35.50	44.70	.....	119.77	.....	30.00	736.29	.396	.042
November.....	325.00	210.15	51.00	38.57	.20	42.12	14.27	30.00	711.31	.416	.045
December.....	325.00	191.43	51.00	3.52	52.10	20.10	.....	30.00	673.15	.387	.042
January.....	335.00	248.72	27.52	75.48	101.09	33.63	.15	30.00	851.57	.510	.055
February.....	335.00	211.86	53.60	18.78	9.33	9.11	.....	30.00	667.68	.417	.045
March.....	335.00	225.30	58.24	15.34	19.82	15.96	.....	30.00	699.66	.358	.038
April.....	370.86	267.84	130.34	35.31	286.53	40.39	.....	30.00	1,161.27	.486	.053
May.....	351.13	374.10	98.70	45.00	397.57	21.39	.....	30.00	1,317.89	.456	.042
June.....	499.75	499.28	180.46	.....	116.00	75.48	.....	30.00	1,401.97	.445	.036
Total.....	4,176.74	3,143.54	811.36	435.76	1,360.00	864.56	16.65	330.00	11,139.61	.437	.044
Per cent of total.....	37.5	28.2	7.3	3.9	12.2	7.8	0.1	3.00	100	.....	.....

though this method does not give the true average head, since the storage capacity of the drain increases with the depth, it is found that the error is negligible so far as the discharge is concerned on account of the flatness of the pump capacity curve.

During the past year the plant was operated on an average of 8½ hours a day, with an average lift of 9.25 feet, except for about 6 weeks during flood stage of the Colorado River, when the head reached a maximum of 14.2 feet and the maximum daily operation was 22 hours.

The force employed has consisted of a chief operator and one assistant operator, with a third during the period of high water. A small amount of common labor was used at times in clearing trash racks and similar work. No additions to the force will be required when the additional units are installed.

The total cost of the present plant was \$130,750, and the estimated cost of the two additional motor-driven pumps, with transmission line, transformers, etc., is \$56,600. The performance and operating costs for the fiscal year 1921 are given in the accompanying tables. The costs of operation are net and do not

Pump performance, Boundary pumping plant, fiscal year 1921.

	Average hours run per day.		Averagelift.		Water pumped.		Gallons, fuel oil.	
	75 hp.	100 hp.	75 hp.	100 hp.	Acre-feet.	Acre-feet.	Per acre-foot.	Per foot acre-foot.
July.....	10.6	8.5	9.9	10.1	2,130	21,130	1.38	0.13
August.....	10.3	8.9	9.3	9.7	2,200	21,040	1.63	.17
September.....	9.8	9.5	9.3	9.4	2,230	20,740	1.14	.12
October.....	7.5	8.1	9.4	9.3	1,860	17,480	1.10	.12
November.....	7.8	7.3	9.2	9.2	1,710	15,810	1.31	.14
December.....	7.5	7.4	9.3	9.3	1,740	16,180	1.18	.13
January.....	7.0	7.2	9.3	9.2	1,670	15,400	1.35	.15
February.....	7.4	7.7	9.2	9.3	1,600	14,740	1.31	.14
March.....	7.9	8.4	9.3	9.4	1,950	18,140	1.33	.14
April.....	6.1	10.7	9.0	9.2	2,390	21,830	1.09	.12
May.....	12.1	13.0	10.8	10.8	2,890	31,370	1.38	.13
June.....	14.7	15.1	12.5	12.5	3,150	39,310	1.74	.14
Total....	9.1	9.3	9.9		25,520	253,170	1.34	.13

include overhead, interest, sinking fund, or depreciation.—D. C. McConaughy, Office Engineer, Yuma project.

REPORT ON CLEANING CANALS WITH MODIFIED DISK HARROWS, MINIDOKA IRRIGATION PROJECT, IDAHO.

AMONG the problems arising to confront the operating forces of a canal system that of combating the growth of aquatic plants is one of the most perplexing. This plant growth does not ordinarily affect the flow of water in a canal to a serious extent for two or three years after its construction. This is because the plant growth is brought into the canals with the water diverted from rivers and storage reservoirs, and some time is required for it to gain a sufficient foothold to obstruct the flow of water.

On the Minidoka Project the plant growth is of two kinds. Both of these are locally called "moss," and the operation of removing them from the canal is called "mossing." One kind is a sort of moss which covers the wetted perimeter of the canals like a blanket, particularly in sections where the velocity of flow is low. The other kind is not a moss but a long, slender plant, sometimes called seaweed, which grows from a small onion-shaped bulb. It sometimes attains a length of 6 feet or more.

The growth of these plants is most rapid in warm weather, and about the last of June or the first of July the seaweed attains a length sufficient to bring it to the surface of the portions of the canals affected. The blanket moss entangles with it and the result is that the capacity of the canals is rapidly reduced. The rate of growth is so rapid as to frequently raise the water surface elevation one-tenth of a foot in a

24-hour period for the same discharge. Unless this condition is remedied immediately the capacity of a given canal may be reduced as much as one-half and the water be forced over the banks. This damages the canal banks and may lead to serious breaks, as well as injury to crops, by flooding at some points and by lack of water at others.

Various methods of removal were tried out on this project with indifferent success. The canal bottoms were dragged with spike-tooth harrows, spring-tooth harrows, and heavy log chains. The Ziemisen submarine saw was used in the canals. In the smaller laterals men with scythes waded and mowed the seaweed. An ordinary farm disk harrow was tried and found ineffective.

Of all the methods tried the submarine saw and the scythes were the most effective agents. They were, however, very slow and expensive. It was necessary to cover the same ground every two or three weeks. The use of scythes also worked a considerable hardship on the laborers, who were forced to spend long hours in the water. Log chains could be used only late in the season, when the moss was ripe.

Watermaster George Haycock learned that the South Side Twin Falls Project had been using a disk harrow with a specially constructed tongue or draw bar with good results. Inspection of this machine at Twin Falls indicated that it would assist in solving

the moss problem for the Minidoka Project, and arrangements were made for the purchase of one complete disking outfit from the Twin Falls Canal Co. On its delivery it was put in operation on the lower end of the J or third lift canal.

The results were even better than had been expected. The machine not only removed moss, but also went down into the silt on the canal bottom and loosened a great part of the moss bulbs which then floated out of the canal. This was removing the root of the trouble, and it was found that only two cleanings were necessary for the season instead of one every two or three weeks with saws and scythes.

On cleaning moss a crew averaged 1 mile per day of main canal and $1\frac{1}{2}$ miles of lateral. The main canals varied from 20 to 25 feet wide on the water line and the laterals 8 to 10 feet. A crew for moss work consisted of a foreman, two teamsters and teams, who worked with the disk, and one laborer, who was stationed on the first check below to remove floating moss. It is believed that with a little closer cooperation with the farmers this last man will not be needed.

The cost per day of the above crew was \$18.50 exclusive of overhead. The average cost per mile with the disk for canals and laterals was \$15 to \$17. Cutting moss by hand cost \$32.50 per mile in 1920 and \$25 in 1921 for one cutting.

In working with the disks it was observed that the water below the point where the machine operated was heavily laden with silt. This suggested that much cleaning of the main canals might be done with these disks late in the season, when it would be possible to remove all checks and to waste water from the canals to the river in a considerable quantity. Two disks were operated on this work with an interval of approximately $\frac{1}{4}$ mile between them. They covered on the average $1\frac{1}{2}$ miles per day. Sixteen and three-fourths mile of canal were covered in this work, and the results were even better than had been expected. After the water was turned out of the canals a careful inspection was made, and it was found that those portions of canal where the disks had been used were in good shape for the 1922 water season without any more work. It was roughly estimated that it would have been necessary to remove about 10,000 cubic yards of silt from the portion of the canals covered by the disks if they had not been used. On this basis the cost of removal was $3\frac{1}{4}$ cents per cubic yard.

The chief drawback to the use of the disk is that it fills the weir and orifice pools with silt. These pools have to be cleaned at times in any case, so the silting is not serious as compared with the saving in cost of silt removal.

The essential difference between the modified disk and the ordinary farm disk harrow is in the steel frame which connects the disks to the drawbar. It

consists of two $\frac{3}{8}$ by $1\frac{1}{4}$ inch steel bars bent to form a semicircle 3 feet in diameter and placed one above the other at a distance of about 4 inches and rigidly bolted together at six points. A horizontal cross brace, consisting of a $1\frac{1}{2}$ by 3 by $\frac{1}{4}$ inch angle, joins the ends of the curved bars. A heavy tongue or draw bar about 8 feet long and shod with steel on both sides is fastened at one end to the center of the angle-iron cross brace. This tongue works between the curved bars described above and can be swung to several angles and bolted rigidly to the semicircular part of the frame. A heavy steel ring is fastened to the other end of the tongue. To this ring two $\frac{3}{8}$ -inch crucible-steel cables 25 feet in length are attached for lateral work, or two 50-foot cables are used on the main canals. The disk is operated by a team on each bank hitched to one of these cables. By adjusting the angle of the tongue the disks may be made to travel on either side of the canal as desired.

Twenty-inch disks are used on $\frac{1}{2}$ -inch steel shafts, and they are so attached to the frame that the cutting angle of the disks may be varied as desired. By the use of different length shafts disks may be added or taken off to vary the width of the machine according to the size of the canal. The weight of the complete machine with set of 10 disks is 415 pounds.

The average cost of two machines, complete, except for cables, was \$112.50 on the work at Burley.—*Hugh L. Crawford, assistant engineer, U. S. R. S.*

COMMENTS BY PROJECT MANAGER BARRY DIBBLE.

We are at present expecting to try a smaller machine with two disks on each shaft for use in our smaller laterals, where we think the outfit will do excellent work.

The Minidoka Irrigation District has been using one of these disks during the past season. They have proposed two modifications which seem to have merit. One of them is a fender which they are making out of automobile springs and which will extend just beyond the outside disks. The machine as it has been built sometimes catches on obstructions in the canal bank, such as turnouts. It is thought that with this fender delay on this account will be avoided. Where this disk is working on a canal bank that is very steep, it can be made to climb the bank in order to clean off the berm that grows in the canal. When the disk is used for this purpose, most of the weight is thrown onto the lower disks. The irrigation district has had trouble with the breaking of the outer disk on this account. They are now proposing to put a 16-inch disk inside and against the 20-inch disk so as to stiffen it and avoid this difficulty.

When the disk is used on steep banks it sometimes rolls entirely over. In order to avoid the twisting of the cable with which it is pulled a swivel is required

in the chain by which the cable is connected to the pole.

Mr. J. C. Wheelon, manager of the Twin Falls Canal Co., who designed the disk, states that on their project they have had to exercise some care to see that the laterals are not cut down too deep. In one or two cases the disking has been overdone to a point where it was impossible to get water into the farm turnouts without putting in temporary checks. The disking of the canal seems to loosen the bulbs from which the "moss" grows, and they are removed from the canal when the moss is thrown out. In this way—after a year or two—the moss is practically eradicated and further disking for this purpose is not necessary until the moss reestablishes itself.

In the discussion at the Idaho irrigation congress one of the canal company managers stated that he had met with considerable success in working the canal early before the moss had reached a length in excess of 18 inches. In this way the moss and the attached bulbs were removed before they became a serious obstruction. It strikes me that this method of handling the moss has a distinct advantage, because when it is small it will neither clog the disk nor require any labor to throw it out of the canals, as it can be allowed to pass through the farm turnouts or wasteways.

The disk, however, is as useful for removing silt as it is for removing moss, and we expect to obtain important results in 1922.

STATISTICS ON LIVE-STOCK CARRYING CAPACITY OF ACREAGE DEVOTED TO HAY AND FORAGE CROPS ON RECLAMATION SERVICE PROJECTS.

IN areas of fair production it should be safe to estimate that a dairy cow or beef animal could be carried on 2 acres of hay and forage; in other words, the acreage devoted to hay and forage on Reclamation Service projects, amounting in 1920 to 582,026 acres,

if used entirely for the maintenance of mature cattle, should carry something over 250,000 head.

It is generally estimated that the forage requirement of a mature cow is equivalent to that of six head of sheep; in other words, the hay and forage

Relation between hay and grain acreage and number of farm animals, United States Reclamation Service projects.

State and project.	Area in hay, forage, and pasture, 1921.		Acreage in corn, barley, oats, etc.	Domestic animals, Dec. 31, 1920.			
	Acres.	Per cent of cropped acreage.		Dairy cattle.	Beef cattle.	Sheep.	Hogs.
Arizona: Salt River.....	80,267	42.02	49,801	11,246	9,065	5,137	8,662
Arizona-California: Yuma, 1920.....	15,040	27.60	2,430	1,215	401	747	1,680
California: Orland.....	10,500	91.70	2,887	2,014	547	1,848	2,973
Colorado:							
Grand Valley.....	8,661	76.10	2,246		¹ 1,046	1,787	980
Uncompahgre, 1920.....	33,987	53.33	8,355	3,370	12,229	10,756	8,934
Idaho:							
Boise.....	57,290	55.43	10,708	6,839	1,970	12,305	7,487
King Hill.....	4,285	79.44	206	424	2,179	531	298
Minidoka, South Side Pumping.....	17,697	40.85	1,929	2,582	903	7,466	4,741
Minidoka, Gravity, Pumping, 1920.....	34,864	62.66	5,496	3,792	216	6,262	5,154
Montana:							
Huntley, 1920.....	9,596	47.93	2,480	1,804	1,312	2,382	1,885
Milk River.....	12,326	76.44	1,168		2,900	8,000	1,180
Sun River.....	8,048	38.16	1,739	979	1,021	963	460
Montana-North Dakota: Lower Yellowstone.....	10,285	51.47	2,328	1,300	1,930	485	1,600
Nebraska-Wyoming: North Platte.....	38,976	35.67	29,233		¹ 7,356	1,100	7,730
Nevada: Newlands.....	36,405	83.82	792	2,072	7,428	4,611	2,211
New Mexico: Carlsbad.....	8,227	33.43	3,164		479	94	426
New Mexico-Texas: Rio Grande, 1920.....	33,590	43.13	12,124		¹ 5,526	3,320	10,437
North Dakota: North Dakota Pumping.....	1,812	92.45	371	305	275	53	335
Oregon: Umatilla, 1920.....	9,369	91.94	142	1,162	51	1,626	1,567
Oregon-California: Klamath, 1920.....	26,722	75.78	5,537		¹ 6,503	29,006	2,720
South Dakota: Belle Fourche.....	35,351	64.16	12,435	2,969	3,751	34,781	11,037
Utah: Strawberry Valley.....	15,560	49.60	1,683		¹ 5,427	2,035	1,793
Washington:							
Okanogan, 1920.....	988	20.08		408	181		373
Yakima.....	65,040	60.29	6,780		¹ 13,005	6,464	18,141
Wyoming: Shoshone.....	26,365	60.07	4,196	1,508	1,153	6,705	2,434
	601,251	51.84	168,230	43,989	86,854	148,464	105,238

¹ Beef and dairy cattle.

acreage of the Reclamation Service projects should carry something over a million and a half head of sheep.

It is rather more difficult to estimate the acreage requirement of forage crops for hogs, so much depending upon the extent to which this forage is supplemented by grain.

The live-stock-carrying capacity of the hay and forage acreage is also influenced by the available supply of such grain crops as barley, corn, and oats. Observations on the Huntley irrigation project indicate that the acreage requirements of a high-performing dairy cow are about as follows: Irrigated pasture, 0.66 acre; alfalfa hay, 1 acre; corn silage, 0.5 acre; and grain (corn, barley, or oats), 1.75 acres. These areas, in good production, on the Huntley project will provide all the feed necessary to support a high-per-

forming cow; in this case a cow that gives 500 pounds of butter fat per year. There are, of course, very few 500-pound cows, and, as their forage requirement is rather higher than that of the ordinary cow producing 250 to 300 pounds of butter fat it would probably be safe to allow 3 acres of good Huntley project farm land to support an ordinary cow. Of this about $1\frac{1}{2}$ acres would be devoted to pasture, alfalfa hay, and corn silage and about $1\frac{1}{2}$ acres to grain (corn, oats, or barley).

The accompanying table shows, by projects, the acreage in 1921 (or 1920 when 1921 figures not available) devoted to hay, forage, and pasture, and the percentage which this acreage is of the total cropped acreage; the acreage in barley, corn, oats, etc., and the number of dairy and beef cattle, sheep, and hogs on the projects on December 31, 1920.

RECLAMATION LAW NOTES.

Construction Charge for Yuma Project Again Upheld.

THE Government has again been fully sustained by the court in connection with the construction charge of \$75 per irrigable acre announced by the Secretary of the Interior in public notice of April 6, 1917, for the Yuma Valley division of the Yuma Federal irrigation project in Arizona.

Suit was brought by the Yuma County Water Users' Association against project officials for the purpose of contesting the right of the Secretary to make the charge in question. The association contended that a certain letter by the Secretary, dated May 10, 1904, was a public notice within the meaning of the reclamation law and fixed the maximum liability of the water users at \$35.28 per irrigable acre. The association also claimed that its contract provided that payments for construction should not be required until the project was completed and that the project was still incomplete, and, therefore, public notice announcing charges could not be legally issued. The United States took the position that the project was in fact complete so far as the Yuma Valley division was concerned, that the Secretary's letter was not a public notice, and that the water users must pay the cost of construction as announced in the public notice of April 6, 1917.

February 26, 1920, United States District Judge William H. Sawtelle dismissed the suit. From this decision the association appealed to the Circuit Court of Appeals, and on November 7, 1921, that court affirmed the decision of the trial court (275 Fed., 885). We quote as follows from the opinion of the Circuit Court of Appeals:

The principal points upon which decision must turn relate to the public notice required to be issued by the Secretary of the Interior and the matter which

it should contain, especially as to the amount of the cost. The formal notice, dated April 6, 1917, was issued pursuant to section 4 of the Reclamation act of June 17, 1902 (32 Stat., 388) and the amendments thereto, and the extension act of August 13, 1914 (38 Stat., 686). It specified certain lands for which water would be furnished under the project; gave notice that all water-right applications must be made to the project manager; specified the classes of charges for water rights, which included a charge against each irrigable acre "to cover the cost of construction of the irrigation system called the construction charge," and an annual charge against each irrigable acre "to cover the cost of operation and maintenance of the system called the operation and maintenance charge," and specified "the construction charge for the unit as \$75 per acre of irrigable land" payable in installments which are enumerated.

Section 4 of the Reclamation act gives authority to the Secretary of the Interior, after determining that an irrigation project is practicable, to cause to be let contracts for the construction work in such portions or sections as it may be practicable to construct and complete as parts of the whole project, provided funds are available in the reclamation fund, and thereupon to give public notice of the lands irrigable under the project of the charges which shall be made per acre upon entries and upon lands in private ownership capable of being irrigated and the number of annual installments in which the charges shall be paid. The section continues:

The said charges shall be determined with a view of returning to the reclamation fund the estimated cost of . . . the project, and shall be apportioned equitably: *Provided*, etc.

The notice was given in clear accord with the statute, and presumably was based upon data and information then at hand. By estimated cost is not meant the actual exact final sums paid for construction, but rather such sums as it is believed after careful computations will cover the expenses and outlay directly and fairly connected with the construction of the project. The statute contemplates that contracts shall be let prior to the giving of the public notice, and the obvious reason for this is to give to the Secretary of the Interior an adequate knowledge upon which to make an estimate.

Correspondence such as there was in the present case between the Secretary and officials of the Reclamation Service, wherein estimates are considered and discussed in laying out the work prior to the date of the contract between the landowners and the United States, can not be regarded as a public notice nor as in any way binding upon the Government. (*Utah Light & Power Co. v. United States*, 243 U. S., 389; 37 Sup. Ct., 387; 61 L. ed., 791.) As the whole theory of the statute is that there shall be a return to the reclamation fund of the estimated cost of constructing the project, manifestly the United States should not be bound by letters or statements published antecedent to plain agreements made pursuant to the statute. It is unfortunate that in the Yuma project there was a substantial and material difference between preliminary engineering estimates and the estimate which was made at a later time; but in the absence of some substantial showing that the action of the Secretary was fraudulent or arbitrary or so erroneous as to justify an inference of illegality or wrongdoing, it is not within the province of the courts to interfere. (*Noble v. Union R. Logging Co.*, 147 U. S., 165; 13 Sup. Ct., 271; 37 L. ed., 123; *Swigart v. Baker*, 229 U. S., 187; 33 Sup. Ct., 645; 57 L. ed., 1143; *N. Y. Canal Co. v. Bond (C. C. A.)*, 265 Fed., 228.)

It is not out of place to say that the increased cost as explained by Chief Engineer Davis, of the Reclamation Service, was because of the unexpected difficulty in managing the rivers, rapid increase in price of labor, change of engineering plans by substituting a siphon under the Colorado for one under the Gila River, increasing mileage of canals, and other important modifications of originally conceived plans.

Moreover, the contract between the United States by the Secretary of the Interior and the Water Users' Association provides that the association will promptly collect or require payment for that part of the cost of the works which shall be apportioned by the Secretary to its shareholders; also that payments for the water rights would be made and enforced by proper means. The fact, therefore, that the cost is greater than was expected can not be urged now as a ground for equitable relief. (*Kihlberg v. United States*, 97 U. S., 398; 24 L. ed., 1106.)

There is no real importance to the point that the system was not completed when this suit was filed. The public notice and the letters of the Secretary of the Interior to the association are based upon his determination that the project was completed. His determination was based upon investigation into facts, and found support in the opinion of an experienced engineer, and we think that in withdrawing certain lands and confining the project to the area described in the public notice the Secretary but exercised discretion and power vested in him under the law.

We can not find that appellants have made any showing which entitles them to relief.

Incapacitated Soldier Entryman to Receive Patents.

An act to authorize certain desert-land claimants who entered the military or naval service of the United States during the war with Germany to make final proof of their entries. (Act Dec. 15, 1921, Pub. No. 111, 42 Stat., —.)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the act of March 1, 1921 (41 Stat., p. 1202), entitled "An act to authorize certain homestead settlers or entrymen who entered the military or naval service of the United States during the

war with Germany to make final proof of their entries," be, and the same is hereby, amended by adding thereto at the end thereof the following matter, which shall be known and designated as section 2 of said act:

"SEC. 2. That any entryman under the desert-land laws, or any person entitled to preference right under section 1 of the act approved March 28, 1908 (35 Stat. L., p. 52), who, after application or entry for surveyed lands or legal initiation of claim for unsurveyed lands, and prior to November 11, 1918, enlisted or was actually engaged in the United States Army, Navy, or Marine Corps during the war with Germany, who has been honorably discharged and because of physical incapacities due to service is unable to accomplish reclamation of and payment for the land, may make proof without further reclamation thereof or payments thereon under such rules and regulations as may be prescribed by the Secretary of the Interior, and receive patent for the land by him so entered or claimed, if found entitled thereto: *Provided*, That no such patent shall issue prior to the survey of the land."

Kern River Company Right of Way Canceled.

On April 14, 1899, the Secretary of the Interior approved for the Kern River Co., under the act of March 3, 1891 (26 Stat., 1095), a right of way for a canal several miles in length through lands of the United States in a public forest reserve in California. The canal was completed in December, 1904, and ever since has been used for developing electric power, but never for irrigation. The Government brought a suit in equity for a decree declaring and enforcing a forfeiture of the right of way, upon the ground that the act of March 3, 1891, restricted the use of such rights of way to irrigation purposes with only an incidental right to use same for the development of power. November 21, 1921, the United States Supreme Court, in *Kern River Co. v. United States* (66 L. ed. 76), upheld the contention of the Government and approved a decree of forfeiture.

Bills Relating to Federal Reclamation.

IN THE HOUSE.

H. R. 9220.—"A bill to stimulate and encourage the development of the agricultural resources of the United States and the establishment of rural homes through Federal and State cooperation by the employment and settlement of veterans of the World War upon the land," introduced November 19, 1921, by Hon. Paul B. Johnson, of Mississippi.

H. R. 9284.—"A bill to provide adjusted compensation for veterans of the World War, and for other purposes," introduced December 5, 1921, by Hon. Luther W. Mott, of New York.

H. R. 9382.—"A bill to authorize the Secretary of the Interior to extend the payment of construction charges on reclamation projects for one year, and for other purposes," introduced December 7, 1921, by Hon. William Williamson, of South Dakota.

H. R. 9547.—"A bill to provide adjusted compensation for veterans of the World War, and for other purposes," introduced December 14, 1921, by Hon. Israel M. Foster, of Ohio.

H. R. 9606.—"A bill to authorize the Secretary of the Interior, in his discretion, to extend the time for payment of construction charges on reclamation projects, units of reclamation projects, or in individual cases, for not exceeding three years, and for other purposes," introduced December 17, 1921, by Hon. M. P. Kinkaid, of Nebraska.

H. R. 9658.—"A bill to provide adjusted compensation for veterans of the World War, to provide revenue for payment by a sales tax upon manufacturers, wholesalers, jobbers, and others, and for other purposes," introduced December 20, 1921, by Hon. Lester D. Volk, of New York.

IN THE SENATE.

S. 2747.—"A bill to encourage the development of the agricultural resources of the United States through Federal and State cooperation, giving preference in the matter of employment and the establishment of rural homes to those who have served with the military and naval forces of the United States," introduced November 16, 1921, by Hon. Charles L. McNary, of Oregon.

S. 2768.—"A bill to appropriate \$5,000,000 for the commencement of the Weber-Provo reclamation project in Utah," introduced November 16, 1921, by Hon. William H. King, of Utah.

S. 2811.—"A bill to encourage the development of the agricultural resources of the United States through Federal and State cooperation, giving preference in the matter of employment and the establishment of rural homes to those who have served with the military and naval forces of the United States," introduced December 8, 1921, by Hon. Charles L. McNary, of Oregon.

S. 2812.—"A bill authorizing the Secretary of the Interior to extend the payment of construction charges on reclamation projects for one year, and for other purposes," introduced December 8, 1921, by Hon. Peter Norbeck, of South Dakota.

S. 2904.—"A bill to extend the time of payment of construction charges on Government reclamation projects and authorizing the transfer of money to the reclamation fund," introduced January 4, 1922, by Hon. Tasker L. Oddie, of Nevada.

S. 2941.—"A bill to encourage the development of the agricultural resources of the United States through Federal and State cooperation, giving preference in the matter of employment and the establishment of rural homes to those who have served with the military and naval forces of the United States," introduced January 7, 1922, by Hon. Charles L. McNary, of Oregon.

Approved Division Designations for Reclamation Service Projects.

Circular Letter No. 977 of March 14, 1921, brought to the attention of the field the desirability of designating the principal parts of projects as "divisions" instead of "units."

With a view to securing standardization of nomenclature, C. L. 1033 was issued on July 23, 1921, the purpose of which was to suggest a designation of the separate areas in each project on a geographic basis. It was suggested that the projects were to be made

up of divisions which will represent the larger areas more or less separate geographically and that these divisions were to be composed of parts smaller in area but having a separate geographic entity. It was not intended, however, that each area opened under public notice should be a new division or a new part of a division. Neither should divisions or parts of divisions be made because of a difference in construction charges; but where included within the exterior boundaries of a division and where the area is in a geographic sense separate from other areas of the division it should be called a part.

Designations of divisions, U. S. Reclamation Service projects.

State and project.	Names of project divisions.
Arizona: Salt River.	No divisions.
Arizona-California:	
Yuma.....	Reservation, Valley, Mesa.
California: Orland...	Main, Millsite.
Colorado:	
Grand Valley....	Garfield Gravity, Garfield Pumping, Orchard Mesa Pumping.
Uncompahgre...	No divisions.
Idaho:	
Boise.....	Arrowrock, Notus, Hillcrest, Black Canyon.
King Hill.....	No divisions.
Minidoka.....	North Side Pumping, South Side Pumping, Lake Walcott Pumping, Gravity.
Montana:	
Huntley.....	Pryor, Eastern, Fly Creek.
Milk River.....	Chinook, Malta, Glasgow.
Sun River.....	Sun River Slope, Greenfields, Mill Coulee, Big Coulee, Fort Shaw, Vaughn, Great Falls, Benton.
Montana-North Dakota: Lower Yellowstone.....	Montana, North Dakota.
Nebraska-Wyoming:	
North Platte.....	Interstate, Fort Laramie, Northport.
Nevada: Newlands...	Carson, Truckee, Pyramid, Lovelock.
New Mexico: Carlisbad.....	No divisions.
New Mexico-Texas:	
Rio Grande.....	Rincon, Leasburg, Mesilla, El Paso.
North Dakota: North Dakota Pumping...	Williston, Buford-Trenton.
Oregon: Umatilla...	East, West.
Oregon-California:	
Klamath.....	Main, Tule Lake, Langell Valley, Lower Klamath Lake, Bonanza Springs.
South Dakota: Belle Fourche.....	No divisions.
Utah: Strawberry Valley.....	High Line, Spanish Fork, Springville-Mapleton.
Washington:	
Okanogan.....	No divisions.
Yakima.....	Sunnyside, Tieton, Kittitas, Kennewick, Roza, Moxee.
Wyoming:	
Riverton.....	No divisions.
Shoshone.....	Garland, Frannie, Willwood, Heart Mountain.
Indian projects.	
Montana:	
Blackfeet.....	North Cut Bank, South Cut Bank, Two Medicine, Piegan, Badger-Fisher, Birch Creek.
Flathead.....	Jocko, Camas, Mission Valley.
Fort Peck.....	Big Porcupine, Little Porcupine, Missouri, Poplar, Big Muddy.

As a result of this circular letter and the ensuing correspondence between the Washington office and the field, names of the various divisions on the projects have been approved, as shown in the accompanying table.

ADMINISTRATIVE AND STATISTICAL PROGRESS REPORTS FOR JANUARY, 1922.

Monthly conditions of principal Reclamation Service reservoirs for January, 1922.

[Elevation above sea level.]

State and project.	Reservoir.	Available capacity in acre-feet.	Elevation.		Storage in acre-feet.			Out-flow in acre-feet.	Elevation of watersurface.		
			Spill-way crest. ¹	Lowest gate sill. ²	Beginning of month.	End of month.	Maximum.		Beginning of month.	End of month.	Maximum.
Arizona, Salt River.....	Roosevelt ³	1,305,000	2103	1903	628,605	692,066	692,066	.....	2074.81	2080.49	2080.49
California, Orland.....	East Park.....	51,000	1199.68	1111.68	11,870	17,230	17,230	.....	1168.23	1174.63	1174.68
Idaho:											
Boise.....	Arrowrock.....	280,000	3211	2956	62,600	103,500	103,500	12,610	3107	3134.7	3134.7
Minidoka.....	Deer Flat.....	177,000	2518	2488	89,749	85,259	89,749	.....	2507.54	2506.9	2507.54
	Lake Walcott.....	95,180	4245	4236	84,240	81,960	85,290	85,000	4244.06	4243.86	4244.15
	Jackson Lake.....	847,000	6769	6730	260,220	288,270	288,270	.....	6743.84	6745.18	6745.18
Montana:											
Milk River.....	Nelson.....	27,000	2214	2200	19,700	19,700	19,700	.....	2209.8	2209.5	2209.8
St. Mary storage.....	Sherburne.....	66,000	4788	4720	.....	.....	.....	.....	.....	.....	.....
Sun River.....	Willow Creek.....	16,700	4130	4085	8,152	8,303	8,303	.....	4120	4120.2	4120.2
Nebraska-Wyoming, North Platte.....	Pathfinder.....	1,070,000	5852	5670	584,740	604,400	604,400	3,255	5824.56	5826	5826
	Lake Alice.....	11,400	4182	4159	5,853	5,120	5,853	.....	4173.8	4172.5	4173.8
	Lake Minatare.....	60,766	4125	4074	53,422	52,604	53,422	.....	4121.5	4121.1	4121.5
Nevada, Newlands.....	Lake Tahoe.....	120,000	6230	6224	.....	.....	.....	13,394	6224.92	6224.75	6224.94
	Lahontan.....	290,000	4162	4060	179,760	191,720	191,720	5,906	4150.7	4152.4	4152.4
New Mexico:											
Carlsbad.....	McMillan.....	45,000	3267.7	3241.6	27,500	32,500	32,500	.....	3264.4	3265.5	3265.5
Rio Grande.....	Elephant Butte.....	2,638,860	4407	4231.5	1,826,444	1,839,060	1,851,677	32,986	4384.2	4384.6	4385
Oregon, Umatilla.....	Cold Springs.....	50,000	621.5	560	.....	.....	.....	.....	.....	.....	.....
Oregon-California, Klamath.....	Clear Lake.....	462,000	4540	4514	331,000	333,500	333,500	.....	4534.91	4535	4535
South Dakota, Belle Fourche.....	Belle Fourche.....	203,000	2975	2920	91,990	101,600	101,600	.....	2938.3	2960	2960
Utah, Strawberry Valley.....	Strawberry.....	250,000	7758	7517	216,200	218,300	218,300	.....	7553.3	7553.6	7553.6
Washington:											
Okanogan.....	Conconully.....	14,400	2290	2232	2,148	2,434	2,434	.....	2255.4	2256.7	2256.7
Yakima.....	Bumping Lake.....	34,000	3426	3389	25,570	9,490	25,570	16,080	3419.4	3402.9	3419.4
	Lake Cle Elum.....	22,800	2134	2122	25,485	14,900	25,485	10,585	2134.6	2129.8	2134.6
	Lake Kachess.....	210,000	2258	2192	171,740	178,795	178,795	.....	2246.5	2248.2	2248.2
	Lake Keechelus.....	152,000	2515	2425	99,705	106,320	106,320	.....	2491.8	2495	2495
Wyoming, Shoshone.....	Shoshone.....	456,600	5360	5132.3	404,039	399,760	404,039	17,000	5351.8	5351.1	5351.8

¹ Or maximum storage.

² Or zero storage.

³ Zero water depth at elevation 1902.2.

⁴ Amount of silt shown by silt survey deducted from original capacity.

⁵ Proposed regulation.

⁶ Estimated low-water limit under proposed plan of regulation.

⁷ Elevation of reservoir raised 12 inches by stop logs in spillway.

SALT RIVER PROJECT, ARIZONA.

Operation and maintenance of irrigation system.—There was little demand for irrigation water during the month owing to the cold weather and considerable rainfall.

Two regular crews were in the field. With a daily average of 74 man-days and 32 stock-days, maintenance work was performed as follows: Main canal cleaned, 1 mile; laterals cleaned, 29 miles; old structures repaired, 30; riprapping (stake and brush banks) built, 311 linear feet; dry masonry placed (repairs), 78 cubic yards; dirt fill placed, 570 cubic yards; concrete placed (repairs), one-half cubic yard.

In addition to the above maintenance work, the Ruth dredger, with a daily average of 4 man-days and 4 stock-days, bermed 26,900 linear feet of the Eastern Canal and built 4 miles of road for the machine to travel on along the Eastern Canal bank.

The P. & H. drag line was engaged in berming the Arizona Canal, with a daily average of 1½ man-days.

Owing to heavy rains of December 31, 1921, and January 1, 1922, Cave Creek broke through the Arizona Canal in the night of January 1, with a flood of approximately 12,000 second-feet. Work was immediately started on making repairs with a crew of 57 men and 64 head of stock; 4,940 cubic yards of sand were removed from the Arizona Canal and 410 cubic yards of dirt fill was made in the Grand Canal.

All work was completed within a period of 12 days and water was again running in the Arizona and Grand Canals on January 13, 1922.

The following construction work was achieved during the month, with a daily average of 36 men and 11 stock: Concrete placed, 21½ cubic yards; dry masonry placed, 5 cubic yards; excavation (dirt) made, 615 cubic yards; fill (dirt) made, 102 cubic yards; concrete pipe installed, 468 linear feet; corrugated iron pipe installed, 275 linear feet; redwood headwalls for culverts built, 16; concrete headwalls for culverts built, 3; new pump laterals built, 3½ miles; 9 by 16 feet standard throw-down bridges built, 8; new well sites fenced, 3; mile fence moved, one-fourth mile; redwood turnout installed, 1; sand and gravel hauled, 18 cubic yards.

Construction of new pump houses was continued. With a daily average of 6 man-days, this crew accomplished the following work: 3 pump houses built in December, 1921, were painted; 1 was completed except painting; 6 were completed including painting; 1, concrete work completed.

Work was continued on widening the Eastern Canal. The Monaghan 2-yard drag line and the Lidgerwood 1½-yard drag line excavated 8,870 cubic yards during the month.

During the first 10 days of January the Lidgerwood machine was undergoing repairs and the Monaghan machine was assisting in moving a transmission

line. On January 20 both machines struck heavy caliche, which made it necessary to place a crew in the field, who put down and shot 360 feet of holes.

Operation of power system.—The total power generated during the month was 2,570,540 kilowatt-hours. The Roosevelt plant operated 406.08 hours, or 54.6 per cent of the month, generating 735,000 kilowatt-hours. The Cross Cut plant operated 99.4 per cent of the time, with a total output of 1,271,900 kilowatt-hours. The South Consolidated plant operated 80 per cent and generated 311,600 kilowatt-hours. The Arizona Falls plant operated 13.5 per cent, generating 17,500 kilowatt-hours. The water was out of the Arizona Canal most of the month. The Chandler plant operated 81.2 per cent, with a total output of 234,540 kilowatt-hours.

The substations all operated without trouble during the month and the pumping plants were all available for service as required.

Construction work—New drainage pumps.—Drilling of 14 new drainage wells west of Phoenix had been completed and the drilling of 1 other was under way; 4 wells were completed during January.

Power lines for new pumping plants.—Five miles of holes were dug and 8 miles of poles hauled; 8 miles of poles north of Tolleson were erected and 5 miles of wire strung; 4 pumping plants were started operating during the month.

Permanent maintenance camp near Tolleson.—One 2½ Kva, 11,000 to 110-220 volt transformer, 11,000-volt fuses, lightning arrester, metering equipment, and a 1½-horsepower motor were installed in the camp.—C. C. Cragin.

YUMA PROJECT, ARIZONA-CALIFORNIA.

January weather was colder than normal, with killing frosts. Some damage was caused to alfalfa. The records for 46 years show an average of two days during January with temperatures of 32° or below. No damage was caused to citrus fruit at Yuma, although the damage in California was very heavy.

Construction.—On the South Drain the 30-b Bucyrus advanced 0.55 mile, reaching the end of the drain on the 16th. This machine was then started back down the drain to deepen it to final grade; 20,000 cubic yards of earth were removed on this drain during the month. Flumes were constructed on the Molloy and Adams laterals and a timber bridge built on a county road at the Cuming lateral. On the East Central Drain the Type 14 Bucyrus advanced one-half mile, excavating 16,500 cubic yards of earth. A timber bridge was built across this drain at Thirteenth Street.

Operation and maintenance.—On the Valley Division Ruth dredges Nos. 8 and 9 cleaned 10½ miles

Crop report, Salt River project, Arizona, for year ending Sept. 30, 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Asparagus.....	3					\$3,000	\$1,000.00
Alfalfa.....	47,355	Ton.....	189,434	4	\$10.00	1,894,340	40.00
Barley.....	15,830	Cwt.....	284,980	18	1.25	356,225	22.50
Beans.....	1,374	Pound.....	1,305,300	950	.06	78,318	57.00
Bermuda.....	700	Cwt.....				10,515	15.00
Berries.....	150					68,770	460.00
Cantaloupes.....	3,882	Crt.....	636,730	164	.47½	304,038	78.31
Corn.....	2,908	Pound.....	4,652,800	1,600	.02	93,056	32.00
Cotton.....	60,720	do.....	51,617,100	850	.09½	4,903,625	80.75
Feterita.....	1,169	Cwt.....	21,042	18	1.25	26,302	22.50
Fruit, citrous.....	1,662	Pound.....	11,634,000	7,000	.05½	639,870	385.00
Fruit, deciduous.....	1,780	do.....	8,005,500	4,500	.03½	280,192	157.50
Garden truck.....	2,478					371,812	150.00
Hegari.....	7,190	Cwt.....	129,400	18	1.25	161,762	22.50
Lettuco.....	626	do.....	172,150	275	1.60	275,440	440.00
Maize.....	16,160	do.....	290,898	18	1.25	363,622	22.50
Oats.....	6,377	do.....	95,666	15	1.45	138,715	21.75
Pasture.....	27,070					406,038	15.00
Potatoes.....	630	Pound.....	4,403,000	7,000	.03½	154,105	245.00
Sorghum.....	167	Cwt.....	3,006	18	1.25	3,758	22.50
Sudan.....	5,142	Ton.....	30,852	6	8.00	246,816	48.00
Vineyard.....	320	Pound.....	2,240,000	7,000	.07	156,800	490.00
Watermelons.....	954	Cwt.....	190,800	200	.72	137,376	144.00
Wheat.....	12,883	do.....	180,442	14	2.00	360,885	28.00
Total and average.....						11,435,380	59.87

	Area (acres).
Total cropped (not including town-site areas).....	217,535
Less duplicated.....	26,535
Net acreage cropped.....	191,000
Plus vacant land, including roadways, ditches, etc.....	5,536

	Area (acres).
Plus home tracts, including house lots, corrals, etc.....	3,032
Total acreage, less duplicated areas.....	199,568
Plus town-site area on which no crop was reported.....	2,862
Total acreage receiving water.....	202,430

¹ Seed.

of laterals, excavating 14,000 cubic yards of silt. On the Reservation Division, Ruth No. 6 cleaned 5½ miles of lateral, excavating 7,700 cubic yards of silt.

The maximum discharge of the Colorado River was 47,000 second-feet, minimum discharge 4,200 second-feet, total for the month 800,000 acre-feet. On January 31 the gauge height was 15.7 with a discharge of 4,200 second-feet.—*Porter J. Preston.*

MESA DIVISION.

On the Mesa Division construction work was carried on with a large force. During the month the change of the central check and turnout, the supply-canal turnout, and the Patterson turnout, located along the project East Main Canal, were practically completed. At the lock-joint pipe manufacturing plant 9,100 linear feet of pipe were cast in sizes ranging from 15 to 36 inches in diameter. Rock was also quarried and crushed for concrete aggregate and road work.

The laying of pipe-line laterals and the construction of minor structures along the lateral system was carried on.

At the B Lift Pumping Plant a small amount of work was done on the outdoor switch yard.—*Porter J. Preston.*

Prevailing crop prices at close of January, 1922.

Project.	Alfalfa hay, per ton.		Barley, per bushel.	Oats, per bushel.	Wheat, per bushel.	Potatoes, per bushel.
	In stack.	Baled at shipping point.				
Salt River.....	\$8-\$10	\$12-\$14	\$0.70	\$0.52	\$1.29	
Yuma.....	10.00	15.00				
Orland.....	12.00	15.00	.53		1.05	
Grand Valley.....	7.00	10.00		.40	.80	\$0.80
Uncompahgre.....	5-10		.55	.30	.80	.60
Boise.....	3.50	8.00	.40	.42	.75	.75
King Hill.....	4-5					.90
Minidoka.....						
Huntley.....						
Milk River.....		6.00	.28	.20	1.06	.90
Sun River.....	5-6	9.00	.48	.40	1.07	.70
Lower Yellowstone.....	6.50	9.50	.40	.40	1.19	.75
North Platte.....	4.50		.35	.30	.80	.80
Newlands.....						
Carlsbad.....		12-15				
Rio Grande.....		15-20		.70	1.20	
North Dakota pumping.....	12.00		.31	.21	1.17	1.00
Umatilla.....						
Klamath.....	4-6		.53	.37	.87	
Belle Fourche.....	6.00	11.00	.40	.33	1.00	1.20
Strawberry Valley.....	9.00	11.00	.63	.50	.80	
Okanogan.....	12.00					1.20
Yakima:						
Sunnyside.....	5-6	8-9.50				.84
Tieton.....	5-6	8-9.50				.84
Riverton.....	5.00	9.00	.50	.40	.95	.60
Shoshone.....	5.00	7.50		.40	.85	.67
Indian projects:						
Blackfeet.....	15.00		.72	.48	1.06	
Flathead.....	12.00	16.00		.47	.93	.60
Fort Peck.....				.18	1.21	1.00

ORLAND PROJECT, CALIFORNIA.

January was characterized by weather of low temperature, a minimum of 21° being recorded at Orland on two occasions, which is 2° lower than the minimum reached in records extending back to 1883. There are only two months of record for Orland during which

a lower mean temperature for January has been recorded. Notwithstanding the low temperature, no damage resulted to any of the project citrus groves, but a loss as high as 75 per cent of the crop was reported from southern California citrus districts, together with permanent injury to the trees themselves in numerous vicinities. All of the marketable products of the project orange groves had been picked and shipped prior to the cold spell and consequently escaped damage. Lemons remaining on the trees were only slightly touched by the frost; other citrus fruits escaped without damage, and no permanent harm to any of the trees has been observed. The survival through this coldest period of record has again demonstrated the advantages of the Orland thermal belt over southern California for citrus culture.

The precipitation at Orland amounted to 1.36 inches, bringing the seasonal total to 8.01 inches. Owing to the cold weather there was no large flow in Stony Creek, and only 5,400 acre-feet of storage was accumulated at East Park reservoir. There was an unusually heavy snow pack on the upper elevations of the Stony Creek watershed, which is a favorable indication for a late natural flow of the stream. The East Park Feed Canal was in operation throughout the entire month.

Placing of concrete lining was continued throughout the month with an average force of 39 men and 18 head of stock. Two and one-fourth miles of laterals were lined, on which 17,580 square yards of lining were placed. Maintenance work consisted of cleaning 7 miles of laterals with teams, repairing structures on the distribution system, together with cleaning and repairing of 12 miles of lined sections.—*R. C. E. Weber.*

GRAND VALLEY PROJECT, COLORADO.

January weather was warmer than normal and conditions were generally favorable for outside work.

There was little change in crop conditions or prices during the month. Alfalfa hay was selling for \$7 to \$10 per ton, with only a limited local market. The interest in dairying on the project was increasing and several registered Holsteins were purchased by project water users recently. A few farmers who purchased lands for feeding this winter were finding the undertaking quite profitable.

Maintenance work was limited to miscellaneous repair jobs on the main canal which could be handled by the regular employees, who also continued work on the installation of weirs and turnouts on the lateral system. Drainage work was prosecuted with the P. & H. excavator, which completed 1,400 linear feet of open drain, involving 6,900 cubic yards of excavation.

An election was held in the Orchard Mesa Irrigation District on January 31 authorizing the execution of the proposed contract with the United States for the rehabilitation of the irrigation system, resulting in an unanimous vote of 72 to 0 in favor of the contract.

The annual meeting of the stockholders of the Grand Valley Water Users' Association was held on January 10. Eleven directors were elected, the proposed contract with the Orchard Mesa Irrigation District was ratified, and the matter of deferment of delinquent charges discussed.—*S. O. Harper.*

UNCOMPAHGRE PROJECT, COLORADO.

January weather was favorable for both construction and operation and maintenance work.

There was some demand for water in the project canals and laterals for stock and domestic purposes, owing to the mild winter weather and the fact that practically no snow lay on the ground.

The P. & H. drag line completed the removal of the sliding material on the main line of the Ironstone Canal at mile post 1, and was then moved up to the Selig Canal headworks for maintenance purposes.

The construction of the section house at the Big Drop of the Montrose and Delta Canal was completed. All of the piling and practically all of the concrete repair work necessary at the Montrose and Delta Canal headworks was completed.—*L. J. Foster.*

BOISE PROJECT, IDAHO.

The precipitation during January was 0.9 inch, which was less than half of the normal. Cold weather prevailed during the greater part of the month.

Labor conditions.—A large number of men were out of employment, with little prospect of improvement in the near future.

Farming operations.—Work on the farms was confined principally to winter feeding of live stock. The hay market remained stagnant; a small amount was purchased for local consumption at prices ranging from \$3 to \$4 per ton in the stack.

Water supply.—The run-off from Boise River was about 77 per cent of normal. Combined storage in Arrowrock and Deer Flat Reservoirs was about the same as a year ago at this time. The snow in the mountains was below normal. The amount falling during December and January was light. The early snow in November, however, was well packed and will probably be slow in melting.

Drainage.—The P. & H. drag-line excavator continued on the Greenleaf Drain until January 20, when it was closed down on account of frost.

Surveys.—Test borings were carried on during the first few days of the month at the Black Canyon diversion dam, but work was suspended on account of ice conditions.—*J. B. Bond.*

KING HILL PROJECT, IDAHO.

January weather was the most severe experienced since the beginning of the project.

Construction.—The erection of Big Alkali flume and wasteway was completed early in the month with the exception of the flume barrel. The 54-inch lock-joint pipe in the Camas road siphon was placed and inlet and outlet structures were poured.

The pipe casting force at King Hill completed 85 per cent of the lock-joint pipe to be manufactured this season.

One field party employed during the month completed survey of Cold Springs Reservoir site.—*Walter Ward.*

MINIDOKA PROJECT, IDAHO.

The month was the coldest January on the local records, which cover a period of 17 years.

The budget of cost for 1922 was prepared and was approved by the Board of Directors of the Burley Irrigation District. Blank forms were sent to water users whose charges were due and unpaid to be used for making statements as to their financial condition. These statements will be sent to the Secretary of the Interior in connection with reports of delinquency. There was some agitation on the project in favor of the postponement of all charges for

Crop report, King Hill project, Idaho, 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	3,560	Ton.....	14,700	4.13	\$4.27	\$62,810	\$17.60
Alfalfa seed.....	106	Bushel.....	327	3.07	7.27	2,388	22.50
Apples.....	560	Pound.....	100,100	178.00	.0225	2,290	4.08
Barley.....	39	Bushel.....	842	21.5	.605	510	13.10
Cane.....	4	Ton.....	6	1.5	10.00	60	15.00
Clover hay.....	16	do.....	14	.85	4.70	66	4.13
Clover seed.....	3	Bushel.....	12	4	48.10	576	192.00
Corn, Indian.....	140	do.....	1,595	11.4	1.15	1,828	13.05
Corn fodder.....	34	Ton.....	203	6	2.70	567	16.70
Fruit, small.....	3	Pound.....				190	63.30
Garden.....	43					3,172	73.76
Hay (other than alfalfa).....	175	Ton.....				1,682	9.60
Oats.....	55	Bushel.....	1,578	29	.866	1,368	24.90
Pasture.....	497					1,292	2.60
Potatoes, white.....	251	Bushel.....	32,733	130	1.004	32,853	131.00
Watermelons.....	83	Pound.....	446,100	5,300	.0086	3,848	46.40
Wheat.....	181	Bushel.....	3,049	16.25	1.21	3,697	20.40
Miscellaneous ¹	40					13	
Less duplicated areas.....	400						
Total cropped.....	5,390	Total and average.....				119,210	22.20
Nonbearing orchard.....	17	Areas.			Acres.	Farms.	Per cent of project.
Young alfalfa.....	303						
Fall-plowed.....	190						
Total irrigated.....	5,900	Total irrigable area farms reported.....			8,722	160	54.0
		Total irrigated area farms reported.....			5,900	160	36.6
		Under contracts with U. S. Reclamation Service.....			5,900	160	36.6
		Total cropped area farms reported.....			5,390	160	33.7

¹ Beans, corn sorghum, peaches, rye, lettuce.

a term of years. In spite of this, however, collections during the month were good.

Reported shipments of farm products were 454 cars, consisting of 4-cars of hay, 60 of grain and flour, 112 of potatoes, 120 of sugar beets, 129 of live stock, and 29 miscellaneous.

At American Falls two purchases of right of way were made costing \$3,155.26. Surveys of the reservoir were continued. Computations and studies in connection with the new town site were also carried on.—*Barry Dibble.*

HUNTLEY PROJECT, MONTANA.

January weather was cold, stormy, and disagreeable.

Maintenance work was confined to repair of equipment, trucks, cars, pumps, and miscellaneous small tools.—*A. R. McGinness.*

MILK RIVER PROJECT, MONTANA.

January weather was unusually mild, but not favorable for construction or operation and maintenance work. The labor supply was ample, with little demand.

Surveys.—Surveys were confined to office work, such as inking topographic sheets made during 1921; the preparation of profiles and schedules for construction contracts to be let the coming season; the completion of data for farm unit plats, including irrigable areas. A temporary building, located at Bowdoin and occupied by a survey party, burnt on January 2, involving a loss of five topographic sheets on which the party was working, together with surveying instruments. The loss of Government records and property amounted to about \$700.

Construction by Government forces.—Work on the flume for Nelson Reservoir enlargement was in progress.

Construction by contract.—The contractor for erection of buildings at Dodson Dam made good progress.

Operation and maintenance.—Inspection and repair of concrete siphons was under way and a little brush and rock protective work was done at various places.—*Geo. E. Stratton.*

ST. MARY STORAGE.

Weather conditions during January were such that no field work could be carried on. The weather averaged cold and rather windy, but there were no extremely severe storms and the snow was not heavy, conditions being favorable for range stock.

The camps at Sherburne Lakes Dam and St. Mary River Crossing were in charge of caretakers.—*R. M. Snell.*

SUN RIVER PROJECT, MONTANA.

January weather was very cold, with some snow.

Telephone line No. 2 was repaired. In the office compiling of statistical reports for the project history was in progress and also the preparation of drawings and specifications for the lateral system of the second portion of the Greenfields Division.

On account of the severity of the weather, the feeding of stock was generally necessary. A comparatively small quantity of hay was baled. A large proportion of the wheat remaining unsold at the end of 1921 was hauled to the elevators. High freight rates to eastern markets prevented extensive shipments of alfalfa hay, and the local demand was limited. Thirty-six cars of hay, eight of wheat, and one of potatoes were shipped from the project.—*Geo. O. Sanford.*

LOWER YELLOWSTONE PROJECT, MONTANA-NORTH DAKOTA.

January weather was unfavorable for construction or maintenance work.

Preliminary crop report, irrigated farms, Milk River project, Montana (exclusive of Chinook and St. Mary Divisions), 1921.¹

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	3,390	Ton.....	5,775	1.7	\$5.00	\$28,875	\$8.53
Alfalfa seed.....	165	Bushel.....	144	0.9	18.00	2,592	15.90
Barley.....	10	do.....	225	23	.40	90	9.00
Beans.....	1	do.....	13	13	2.50	32	32.50
Corn, flint.....	113	do.....	4,398	40	1.00	4,398	38.92
Corn fodder.....	96	Ton.....	395	4.1	4.00	1,580	16.45
Flax.....	80	Bushel.....	512	6.5	1.55	793	10.04
Garden.....	35	.....	.....	.....	.....	5,105	145.85
Hay.....	8,840	Ton.....	5,927	0.7	6.00	35,566	4.02
Oats.....	1,045	Bushel.....	26,939	26	.40	10,775	10.32
Potatoes.....	35	do.....	5,734	164	1.00	5,734	163.83
Wheat.....	2,550	do.....	31,173	12	1.10	34,290	13.47
Less duplicated areas.....	250	.....	.....	.....	.....	.....	.....
Total cropped.....	16,110	Total and average.....	.....	.....	.....	129,830	8.06
Young alfalfa.....	290	.....	.....	.....	.....	.....	.....
			Areas.		Acres.	Farms.	Per cent of project.
			Total irrigable area farms reported.....		30,789	178	30
			Total irrigated area farms reported: Under rental contracts.....		16,400	178	16
Total irrigated.....			Total cropped area farms reported irrigated.....		16,110	178	16

¹ This report covers 11,436 acres irrigated from United States Reclamation Service canals and 4,948 irrigated from private flood-water systems
Duty of water from United States Reclamation Service canals, 0.54 acre-foot per acre.

² 101 farms more than 50 per cent irrigated; 77 farms less than 50 per cent irrigated.

Maintenance work consisted of hauling 25 yards of rock to be used for riprap at the outlet of the Savage sluice gate and cutting brush in the Main Canal.

The engineering force engaged in connection with contract 864 completed the taking of final estimates on schedules completed and finished field engineering work relative to location of all canals and laterals for right-of-way purposes. The office engineering work consisted of computing final estimates and plotting location of laterals under extensions on the project right-of-way map.

Profiles were being taken of the cross-section lines where test holes have been dug in connection with drainage investigations.—*L. H. Mitchell.*

NORTH PLATTE PROJECT, NEBRASKA-WYOMING.

Operation and maintenance.—Interstate Division: Maintenance work was confined to the straightening of lower chord members of main canal bridges on the first division of the Main Canal, and the repair of check at Mile 41.0, Main Canal. Other maintenance work consisted of the removal of weeds and ice jams from the headwalls of culverts on open drains.

Fort Laramie Division: Maintenance work consisted of building operation roads over Tunnels No. 1 and No. 2 and the removal of wire fences ahead of dragline No. 121247. This machine suspended operations on the 17th.

Crops.—Of a total of 53,989 tons of alfalfa hay and 1,753,730 bushels of grain raised on the project the past season approximately 50 per cent remained unsold. The stock census showed that 65,000 head of sheep, 3,000 head of cattle, and 150 head of horses had been brought into the project for winter feeding. Recent market shipments of sheep yielded large profits to shippers, and the same is true of cattle but to a lesser extent.

Drainage.—Dragline No. 122229 completed the excavation of the Minatare Drain on the 19th and was moved to camp for repairs. Construction forces were engaged in constructing a bridge across the above drain at station 274+34 and tearing out two old and unused bridges which have been obstructing the flow in the Nine Mile Drain. The steel sheet piling and steel forms used in the construction of the Minatare Drain Siphon were loaded and shipped to Mitchell.

Electric dragline No. 131313 on the Fort Laramie Division continued work on the Katzer Drain throughout the month between station 100+50 and station 149+30, completing 0.9 mile of drain.

Construction.—At Pathfinder Dam the placing of emergency gate and appurtenances and the lowering into canyon and placing of rear cases and needle cases to valves was accomplished. The excavation of a drain tunnel from valve house to old north tunnel was completed.

Fort Laramie Division: The three electric draglines continued work on the Fort Laramie Canal, completing 1.19 miles of canal during the month. At the end of the month the Second Lateral District was 85 per cent complete.

Northport Division: Dragline No. 121471 continued work on the Northport Canal, completing 0.25 mile of canal.

Power system.—The Lingle Power Plant delivered 5,500 kwh. to Lingle, Wyo., 33,100 kwh. to Torrington, Wyo., 10,700 kwh. to Morrill, Nebr., and 32,400 kwh. to Mitchell, Nebr., during the month. The total output of the plant this month, 253,490 kwh., was the largest since the plant has been in operation, exceeding that of last month by 410 kwh.

Surveys.—The field parties on the location and irrigable area surveys on the Horse Creek and Table

Preliminary crop report, dry-farmed units, Milk River project, Montana (exclusive of Chinook and St. Mary Divisions), 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	1,685	Ton.....	2,915	1.7	\$5.00	\$14,575	\$8.70
Alfalfa seed.....	123	Bushel.....	107	0.9	18.00	1,926	15.65
Barley.....	14	do.....	700	50	.40	280	20.00
Beans.....	3	do.....	43	14	2.75	118	39.33
Beets, sugar.....	4	do.....	14	3.5	3.00	42	10.50
Cane.....	8	do.....	8	1.0	4.00	32	4.00
Corn, flint.....	355	Bushel.....	8,104	23	1.00	8,105	22.90
Corn fodder.....	273	Ton.....	485	1.8	4.00	1,940	7.10
Flax.....	183	Bushel.....	1,648	9	1.55	2,554	13.95
Garden.....	57	.....	.....	.....	.....	8,887	155.91
Hay.....	3,873	Ton.....	3,025	0.8	6.00	18,150	4.68
Oats.....	1,958	Bushel.....	35,404	18	.40	14,161	7.25
Potatoes.....	103	do.....	11,684	113	1.00	11,684	113.44
Rye.....	3	do.....	30	10	.65	19	6.33
Spelts.....	30	do.....	486	16	.50	243	8.10
Sudan grass.....	15	do.....	3	0.2	4.00	12	.80
Wheat.....	4,080	Bushel.....	54,157	13	1.10	59,572	14.60
Less duplicated areas.....	277	.....	.....	.....	.....	.....	.....
Total cropped (dry farmed).....	12,490	Total and average.....	.....	.....	.....	142,300	11.40
Young alfalfa.....	350	Areas.....	.....	.....	.....	Acres.....	Farms.....
Grand total cropped (dry farmed).....	12,840	Total irrigable area farms reported.....	.....	.....	.....	23,187	1186
		Total cropped area farms reported dry farmed.....	.....	.....	.....	12,490	1186

¹ 103 farms dry farmed; balance of area included in farms partially irrigated.

Mountain Lateral systems had taken 9,500 acres of irrigable areas. When weather condition did not permit field work the force was engaged in office work on estimates, etc.—*E. E. MacDonald.*

NEWLANDS PROJECT, NEVADA.

Project operations were considerably hampered by cold weather during January.

Several meetings were held by the Board of Directors of the Irrigation District and also meetings of water users were held to consider the deferment of operation and maintenance charges, the payment of the operation and maintenance deficit, and to select delegates to meet the Secretary of the Interior in Washington to secure definite action on these matters. Director True Vencill and Attorney R. W. Stoddard, accompanied by the project manager, left on January 26 to attend a scheduled meeting with the Secretary on February 1.

The Lahontan power plant was operated from both the Lahontan Reservoir and Truckee Canal as conditions and work in progress necessitated.

About 50 feet of Tunnel No. 1, Truckee Canal, was timbered. Cold weather and ice made it necessary to discontinue this work about the middle of January, following which the permanent camp, consisting of bunk house and combined cook and mess house, was practically completed.

Several minor lateral structures were repaired, and trees and willows were removed from several miles of laterals.

On January 16 bids were opened for the cleaning of about 42 miles of laterals. Contracts were awarded for practically all of this work. Bids ranging from \$1.50 to \$11 per station of 100 feet were accepted, the average unit price being about \$4.30 per station.

Freezing of the Truckee Canal made it necessary to discontinue the operation of the Austin drag line in removing rock slides from concrete lined sections after the middle of the month.

Drainage work was continued with the use of six drag-line excavators, except during the latter part of the month, when frozen ground made it necessary to shut down two of the machines, one of these machines being at Fernley, work having commenced on the Fernley Drain on January 13, using a Monaghan drag-line excavator.—*D. S. Stuver.*

CARLSBAD PROJECT, NEW MEXICO.

January weather was for the most part fair.

The regular winter maintenance work commenced on January 1. Four crews under the direction of the regular maintenance foreman and three ditch riders were in charge of the work, which consisted of burning lateral and canal banks and removing silt bumps and Bermuda sod from the lateral system, together with other minor repairs. General repairs of painting with tar was in progress on the metal flume on the Black River Canal. All of the canal gates, including the spillway structures and the turnout gates, were cleaned and painted with tar.

Labor was ample, common laborers being paid at the rate of \$1.50 per day to as high as \$2 for expert labor. These prices are practically the same for labor employed on the street-paving construction, as well as for Government and farm requirements.

A few carloads of alfalfa hay were shipped from the project during the month at prices averaging about \$15 per ton. The cotton gins were all closed down by the 10th of January, and practically all of the cotton remaining on the project belongs to a few farmers and business men, who were holding for higher prices in the spring and summer. Plowing for spring crops was in progress. Indications pointed to a large cotton crop for the ensuing season. A considerable acreage of alfalfa, where wild grasses were bad, had been plowed up and will be planted to cotton.

The annual crop report shows a total cropped area of 21,620 acres. Total crop production was valued at \$919,600, or \$42.53 per acre. Total collections for the winter amounted to \$20,222.65. The O. & M. bills

Crop report, Carlsbad project, New Mexico, 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	7, 170	Ton.....	21, 793	3.04	\$8. 43	\$183, 766	\$25. 63
Alfalfa seed.....	1, 161	Pound.....	156, 925	135.	. 11	17, 132	14. 75
Cane.....	324	Ton.....	960	2. 96	5. 43	5, 215	16. 09
Corn fodder.....	79	do.....	151	1. 91	5. 00	755	9. 56
Corn, Indian.....	2, 209	Bushel.....	42, 184	19. 10	. 44	18, 308	8. 29
Cotton, lint 1.....	9, 200	Pound.....	12, 700, 000	293. 48	. 225	607, 500	66. 03
Cotton, seed.....	9, 200	do.....	5, 400, 000	587. 00	. 011	59, 400	6. 45
Garden and orchard.....	108					6, 480	60. 00
Oats.....	671	Bushel.....	9, 221	13. 74	. 49	4, 546	6. 77
Pasture.....	978					5, 573	5. 70
Potatoes, sweet.....	11	Pound.....	39, 100	3, 555	. 06	2, 465	224. 09
Sorghum.....	284	Bushel.....	5, 828	20. 54	. 41	2, 388	8. 41
Wheat.....	586	do.....	6, 327	10. 79	. 97	6, 122	10. 45
Less duplicated areas.....	10, 361						
Total cropped.....	21, 620	Total and average.....				919, 650	42. 53
Young alfalfa.....	540						
Cotton, no crop due to hail.....	850						
Other crop failures.....	800						
Total irrigated.....	23, 810						
		Areas.			Acres.	Farms.	Per cent of project.
		Total irrigable area farms reported.....			24, 990	474	100
		Total irrigated area farms reported.....			23, 810	474	95
		Under water-right applications.....			24, 990	474	100
		Total cropped area farms reported.....			21, 620		87

15,400 500-pound bales of cotton.

for 1921 were prepared and mailed on the 26.—*L. E. Foster.*

RIO GRANDE PROJECT, NEW MEXICO-TEXAS.

January weather was normal. Water was released from Elephant Butte Dam on the 24th, that it might be in all main canals in time for the opening of the irrigation season, February 1. Sand sluicing in the main canals was begun as soon as the water was put through. On the West Side Canal the sand was moving out, but the work had to be stopped to make repairs to the concrete lining. On the Franklin Canal the skimming weir was passing water that contained considerably less sand than heretofore and the effect was very noticeable in the length of canal below as the sand was being sluiced out of sections where it always accumulated in previous seasons.

The winter cleaning, begun January 1, was practically completed, 120,000 cubic yards being removed by contract and about 6,000 cubic yards by Government forces. Contracts were also let for the removal of weeds from canal banks, the price ranging from \$8 to \$24 per mile of canal. Considerable ground was being leveled and ditched, and land was being prepared for seeding earlier than last year. Fall wheat and young alfalfa were ready for water.

In the Mesilla Valley only one excavator continued on drainage construction. The other machines were employed on canal and lateral reconstruction during the nonirrigation season, the two principal features being the Leasburg extension No. 2 and the concrete lining of 6,000 feet of the West Side Canal. The construction of 2,000 feet of new canal for the Leasburg Canal extension No. 2 and the reconstruction of 8,500 feet of old canal eliminated entirely 2.7 miles of main lateral in three parallel locations.

In the El Paso Valley two excavators and one contract machine continued drainage construction, excavating 79,000 cubic yards in 1.4 miles of drain. Two excavators were employed on canal and lateral work, excavating 42,000 cubic yards. A team crew began the reconstruction of the Jornada sublaterals.

D. C. Henny, consulting engineer; F. E. Weymouth, chief engineer; and James Munn, construction engineer, comprising a board of consulting engineers, met on the project from January 24 to 26 to make investigation of river conditions between El Paso and Fabens, Tex.

A. T. Strahorn, soils engineer of the Department of Agriculture, completed his alkali investigations in the El Paso Valley on January 25.

A delegation of 56 farmers from the vicinity of Las Lunas in the middle Rio Grande Valley, headed by Edw. Otero, made a visit to the New Mexico section of the project for the purpose of investigating drainage and irrigation conditions.—*L. M. Lawson.*

NORTH DAKOTA PUMPING PROJECT.

Weather conditions were unfavorable for outside work, but in the power plant and mine work unusual conditions were anticipated.

There was an unusual amount of office work on costs, estimates, plans for the immediate future, all of which is normal during the first month of the year. The irrigation district officials took a live interest in this work and met several times during the month at the project office to consider operating problems.

The power plant was operated for the commercial power contract; 103,000 kilowatt-hours of electrical energy were delivered to the city of Williston. The amount of energy sold and the return were approximately the same as during the same month of last year.

Preliminary crop report, North Dakota pumping project (Williston Division), 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	525	Ton.....	1,057	2.00	\$10.00	\$10,570	\$20.00
Barley.....	65	Bushel.....	1,470	22.60	.48	705	10.85
Clover hay.....	77	Ton.....	130	1.70	10.00	1,300	17.00
Corn.....	71	Bushel.....	1,470	20.70	.60	882	12.42
Corn fodder.....	92	Ton.....	434	4.70	8.00	3,470	37.73
Garden.....	80	Acre.....				11,268	141.00
Hay.....	509	Ton.....	557	1.10	10.00	5,570	11.00
Hay, millet.....	83	do.....	194	2.30	8.00	1,552	18.70
Hay, sudan grass.....	13	do.....	54	4.20	12.00	648	50.00
Oats.....	235	Bushel.....	5,035	21.40	.35	1,760	7.48
Pasture.....	513	Acre.....				3,750	7.30
Potatoes.....	81	Bushel.....	9,280	114.50	1.00	9,280	114.60
Miscellaneous ¹	16					3,565	216.60
Less duplicated areas.....	400						
Total cropped.....	1,960	Total and average.....				54,320	27.70
Young alfalfa.....	81						
Young sweet clover.....	186						
Ground fall plowed.....	6						
Miscellaneous.....	42						
Less duplicated areas.....	195						
Total irrigated.....	2,080	Total irrigable area farms reported.....			4,037	76	53
		Total irrigated area farms reported.....			2,080	76	27
		Under water right applications:					
		Under irrigation district contract.....			2,080	76	27
		Total cropped area farms reported.....			1,960	76	26

¹ Beans, clover seed, small fruits, onions.

Nine hundred and twenty-one tons of coal were mined.—*Wm. S. Arthur.*

KLAMATH PROJECT, OREGON-CALIFORNIA.

January weather was unusually cold.

The Diversion Canal was operated during the entire month diverting water from Lost River to the Klamath River. With the exception of the gate tenders at Clear Lake and at the Lost River Diversion Dam, no operating forces were employed.

A large part of the project hay crop remained unsold. The asking price ranged from \$4 to \$6 per ton in the stack; even at this price the hay was moving slowly. The low demand for hay was due principally to the depletion of range stock during the period of high prices.

One survey party was engaged from the 1st to the 10th in connection with the precast flume job on the C Canal.

The office engineering force was engaged in preparing designs for structures for the Tule Lake Division, and on studies and investigations on water supply and control.

Bids for leasing the Tule Lake lands were opened on the 23d. Over 100 bids were received, varying in amount from \$50 per lot to \$5.20 per acre. The tracts ranged from 40 to about 160 acres. About 13,500 acres will be leased with a rental amounting to \$11,000.

On the C Canal, the erection of the precast units and the construction of the special structures was completed on January 11. Camp C was closed for the winter on January 21. The work remaining to be done on the flume job consists principally of grouting about 60 per cent of the joints and the interstices at the ends of the middle stringers.—*Herbert D. Newell.*

BELLE FOURCHE PROJECT, SOUTH DAKOTA.

January weather was typical of midwinter conditions on the western plains. Light Chinook winds brought thawing temperatures for a few days, but in general the weather was cold, with frequent snowstorms and high winds. About 10 inches of snow fell during the month, and this, added to that already on the ground, made it necessary for stockmen to feed continuously. Roads were badly drifted and travel was almost at a standstill for several days, hauling being done mostly on sleds.

The feeder canal was operated continuously and diverted 10,107 acre-feet of water into the reservoir. The maximum flow was 174 and the minimum flow 88 second-feet. The full flow of the river was diverted during the month.

Alfalfa prices advanced \$1 or \$2 during the month owing to the continued cold weather and heavy snows. Indications were that the surplus hay in the valley may all be used up before grass comes. It was reported that many sheep being wintered without sufficient feed were dying on the Moreau River, north, and that there were a number of herds of cattle suffering for feed in the dry-land section. Undoubtedly these cattle and sheep would have drifted into the project were the roads in condition to trail them through, and it is possible that a portion, at least, of the cattle will be brought in, although the only possible means of bringing the sheep will be on sleds. Butter fat dropped 10 cents during the month in line with the general decline of dairy products throughout the country. Lambs continued to advance, and at the close of the month were sold at about 11½ cents locally, while the top of the market in Omaha ran

around 13 cents. All farmers who have fed lambs this year are making excellent returns. The profit has been very much greater than might have been expected, however, earlier in the season.—*B. E. Hayden.*

Summary of employees for January, 1922.

	Begin- ning of month.	End of month.	Increase.	Decrease.
Washington office.....	82	82		
Denver office.....	74	73		1
Field, legal.....	23	23		
Examiners of accounts.....	3	3		
Yuma.....	115	121	6	
Yuma auxiliary.....	131	140	9	
Orland.....	70	70		
Grand Valley.....	27	26		1
Uncompahgre.....	78	66		12
Boise.....	70	58		12
King Hill.....	93	73		20
Minidoka.....	87	80		7
Huntley.....	9	8		1
Milk River.....	51	34		17
St. Mary storage.....	10	10		
Sun River.....	27	23		4
Lower Yellowstone.....	18	18		
North Platte.....	312	233		79
Newlands.....	120	109		11
Carlsbad.....	18	34	16	
Rio Grande.....	500	509	9	
North Dakota pumping.....	22	22		
Umatilla.....	25	25		
Klamath.....	65	33		32
Belle Fourche.....	15	15		
Strawberry Valley.....	51	20		31
Okanogan.....	10	8		2
Yakima.....	101	100		1
Tieton Dam.....	179	182	3	
Riverton.....	80	67		13
Shoshone.....	286	181		105
Blackfoot.....				
Flathead.....	33	34	1	
Fort Peck.....	5	7	2	
Unassigned per diem.....	24	24		
Secondary.....	34	73	39	
Total employees.....	2,848	2,584		
Increase.....			85	
Decrease.....				349
Net decrease.....				264

STRAWBERRY VALLEY PROJECT, UTAH.

January weather was generally fair with intermittent storms and low temperatures.

Farm products.—A slight advance in the price of wheat occurred during the latter part of the month, which, together with the general increase in price of beef cattle and lambs, resulted in a few shipments of these commodities to eastern and Pacific coast points.

Sugar-beet factories operating in Payson and Spanish Fork finished their campaign about the 25th of the month.

Hydrographic data.—The surface of Strawberry Reservoir rose 0.3 foot to elevation 7553.6. Plenty of water was available in Spanish Fork River to operate the power plant continuously.

Labor conditions.—Scarcity of work in the intermountain country produced an oversupply of labor of all classes, so that no difficulty was experienced in obtaining ample when required.

Operation and maintenance, storage system.—Operations at West Portal camp on repairs to Strawberry Tunnel were continued until the 28th, with a force of 28 men and 3 teams, when work was completed, the plant dismantled, and camp closed. Altogether 3,800 linear feet of new floor were put in between stations 85+00 and 47+00.

Operation and maintenance, power system.—The power plant was operated without interruption and power furnished to the towns of Spanish Fork, Payson, Springville, and Salem. Extremely cold weather and heavy snow caused considerable trouble in the operation of the power canal from slush and anchor ice.

General.—Collection of construction and operation and maintenance charges during the month aggregated about \$9,000, and on the last day of the month approximately 57 per cent of the collections had been made.—*W. L. Whittemore.*

OKANOGAN PROJECT, WASHINGTON.

January weather was cold with little precipitation. At the close of the month there was not enough snow in the watershed for a proper supply of water for the project.

A foreman with a few laborers completed the moving of the steam shovel from Conconully to Omak early in the month and were laid off for the rest of the time. The master mechanic and one helper were engaged in making repairs and overhauling project automobiles and trucks. The office force was employed on making various reports, on routine office work, and on working up data necessary for curves and tabulations for the annual project history and operation and maintenance report.—*Calvin Casteel.*

YAKIMA PROJECT, WASHINGTON.

January temperature was below normal, the mean being the lowest of record, except in 1916. Snowfall during the month and depth of snow on ground at end of month at the storage reservoirs are shown in the following table:

Reservoir.	Snowfall during January.	Depth of snow Jan. 31.
	Inches.	Inches.
Keechelus.....	53	42
Kachess.....	32	27
Cle Elum.....	29	16
Bumping.....	35½	39

Maintenance, Sunnyside Division.—Continued cold weather prevented the prosecution of the regular program of maintenance work, and the maintenance crews were laid off. Work performed consisted of grubbing willows on main and branch canals, enlarging openings in Sulphur Creek Wasteway drops, and repairing patrol houses. Contract work on placing riprap at main canal headworks, and grubbing of willows along Sulphur Creek Wasteway was discontinued. Overhauling and repair of pumps and turbines for the several pumping plants was carried on in the machine shop.

Maintenance, Tieton Division.—On account of weather conditions all structure maintenance was discontinued on the 7th, and the entire repair crew laid off. Work accomplished consisted of completion of two betterment jobs, involving replacement of small wooden flumes with 300 feet of 10-inch wood-stave pipe and the same quantity of 8-inch sewer tile. The patrol force was employed on repair of telephone lines and on cutting and grubbing willows on main and sublaterals.—*J. L. Lytel.*

TIETON DAM.

January weather was marked by unusual cold and storms that interfered seriously with outside work.

Repairs, consisting of rock-filled cribs and earth embankment to the diversion dam were about completed. The core-wall trench, which had been filled with water during the December flood, was unwatered and excavation resumed. No concrete was poured. Stripping in the river bed was resumed with the Marion shovel, but had to be discontinued because the blasting of frozen ground endangered the core-wall excavation and timbering below. Other work consisted of coyote holes for rock spillway excavation, test pits on spillway line, burning brush in reservoir, getting out timbers for cableway head tower, construction of a log boom across the river above tunnel entrance, and clearing logs from dam site.

Labor was plentiful but, with the exception of permanent employees, was inefficient. The average number of men employed was 180.—*F. T. Crowe.*

RIVERTON PROJECT, WYOMING.

The temperature during January was unusually cold. The roads were in fair condition throughout the month, except for occasional drifts. The weather was unfavorable for construction. The flow of Wind River was about normal.

Two draglines were operated on the canal at intervals when weather permitted, moving 16,802 cubic yards. Of this material 6,861 cubic yards was class 1, a sandy loam, and 9,140 cubic yards was class 3, sandstone. Repairs on both machines were unusually heavy throughout the month, and complete shutdown on account of cold weather was necessary for several days.

On the Wind River Diversion Dam a dragline completed the cut-off trench under the dike and did some stripping for the dike site and was then overhauled. The total excavation by this machine was 5,170 cubic yards.

One survey party was employed at Pavillion on canal location and investigations.—*H. D. Comstock.*

SHOSHONE PROJECT, WYOMING.

January was an unusually cold and stormy month. Frequent snow squalls interrupted outside work materially and caused some bad roads.

Water supply.—The Shoshone River was at a low stage the entire month and the water surface in the Shoshone Reservoir dropped 0.7 foot during the month. A notch was cut in the spillway of the reservoir during the month in connection with construction work at the power plant. This resulted in bringing the outflow of the reservoir practically equal to the inflow.

Operation and maintenance.—A contract was let for furnishing 150 cubic yards of cobble rocks for riprap below the Garland Canal crossing of the Cody branch of the Chicago, Burlington & Quincy Railway. Some trouble was experienced with ice at the Garland Canal wasteway into Bitter Creek, filling the channel and overflowing the banks. This ice comes from seepage water that is collected in the Garland Canal and does not freeze until it reaches the lower end of the canal and the wasteway.

Crops.—Work on the farms comprised hauling loose hay to the alfalfa mill and baling and hauling hay for shipment. The following shipments were made during the month: Alfalfa meal, 59 carloads; alfalfa

hay, 168; oats, 1; wheat, 4; potatoes, 4; honey, 1; stock hogs, 1; cattle, 5; sheep, 3.

Drainage.—One machine was in operation on surface drain 105; 23,290 cubic yards of material were handled, of which 17,330 cubic yards were spoil-bank material, which it was necessary to move to finish excavation. Much of the material excavated during the month was class 3. At the close of the month the organization was reduced to a small force, which will be engaged upon repairs and electrification of several of the machines on the project.

Field and office engineering.—One field crew worked on the Willwood irregular subdivision surveys from the Powell office; one crew on the Frannie Division worked on land classification along the banks of Pole Cat Creek and on drainage investigations. Office work consisted of work on the project history and other semiannual reports, a board report on Frannie Division drainage, and work in connection with drainage and power-plant construction.

Construction.—At the power plant the cofferdam at the base of the dam was pumped out, the last joint on each of the 42-inch blow-off pipes through the base of the dam was removed, the taper pipe and 48-inch valves were installed, and work on connecting these valves with the power tunnel was begun. The installation of the steel pipe from the lower end of the power tunnel through the power house to the by-pass house was practically completed. Practically all concrete work on the by-pass valve house was finished. The concreting of the west, south, and east power-house walls was completed. The erection of the main roof trusses was also finished, and the forms and steel placed so that the roof slabs can be poured as soon as the weather permits. Considerable work was also done on the power-house wiring and setting up of electrical equipment.

On the transmission line work was continued on the reach from Powell to the power plant, and this was completed except for about $1\frac{1}{2}$ miles in the Shoshone Canyon; 5.8 miles of line were completed during the month, making the total completed line 29.6 miles long.

Settlement.—The water users' associations of the Garland and Frannie Divisions have been active in the discussion of relief from construction and past operation and maintenance payments. A third water users' association was organized during the month known as the Veterans' Water Users' Association. J. M. Evans, a unit holder of the Frannie Division, was elected president, and Dr. T. Ice, of Powell, was elected secretary-treasurer.—*J. S. Longwell.*

INDIAN PROJECTS, MONTANA.

BLACKFEET PROJECT.

January weather averaged cold and windy, but there were no very severe storms and the snow was not heavy, conditions being favorable for range stock.

No construction or survey work was carried on, and no men were employed in the field, all operation and maintenance camps being closed for the winter.

No farming operations were carried on other than the feeding of stock.—*R. M. Snell.*

FLATHEAD PROJECT.

Weather conditions were more severe than the average for the month of January for the years since records have been taken. Snow conditions were ex-

cellent for the land and indicated that there will be a large run-off from the project watershed this year.

Hauling of cement by Russell & Hoyer, contractors, on the Dry Creek Canal lining was in progress.

Hay and grain crops showed higher prices and better demand.

Live-stock conditions were good. On account of the snow, feeding of range cattle was necessary everywhere.—*C. J. Moody.*

FORT PECK PROJECT.

Several cold snaps occurred during January, but they were of short duration, and the month as a whole was bright and pleasant.

The P. & H. dragline was loaded and shipped to the Rio Grande project.

Grain prices were a little higher and some wheat was marketed. The outlook as regards livestock was somewhat improved, owing to prospects of better prices. Feed was ample and the stock in good condition.—*S. A. Kerr.*

Consolidated balance sheet of cash, investment, and capital funds. Jan. 31, 1922.

		Subtotals.	
DEBITS.			
Group 1—Cash:			
With Treasurer, U. S., reclamation fund.....	\$1,550,913.30		
With Treasurer, U. S., unadjusted.....	1511.68		
With Treasurer, U. S., Yuma auxiliary fund.....	122,344.96		
With Treasurer, U. S., drainage and cut over.....	205.93		
With special fiscal agents, reclamation fund.....	617,943.50		
With special fiscal agents, Yuma auxiliary.....	21,899.15	\$2,312,795.16	\$2,312,795.16
Group 2—Investment:			
Disbursement vouchers (all funds).....	169,052,444.28		
Transfer vouchers received (all funds).....	9,027,976.26	178,080,420.54	
Less—			
Collection vouchers (all funds).....	39,536,360.51		
Transfer vouchers issued (all funds).....	9,027,976.26	48,564,336.77	
Project net investment.....			129,516,083.77
			131,828,878.93
CREDITS.			
Group 3—Capital fund:			
Sales of public lands.....	103,755,633.16		
Sales of town-site lots.....	552,518.24		
Potassium royalties, etc.....	13,716.47		
Proceeds, oil leasing act, past.....	3,949,920.19		
Proceeds, oil leasing act, future.....	1,451,624.80		
Bond loan.....	20,000,000.00		
Less repayments.....	1,600,000.00		
Rio Grande Dam appropriation.....	1,000,000.00		
Drainage and cut-over appropriation.....	100,000.00		
Net increase of compensation fund.....	2,095,256.21		
Judgments, Court of Claims.....	450,118.65		
Yuma Auxiliary land sales.....	60,091.21	131,829,078.93	131,828,878.93
Total.....			131,828,878.93

¹ Deduct.

GENERAL OFFICES.

Washington office.—Director Davis was in charge of the office during the entire month, except for two days when he was out of the city. During his absence the office was in charge of Assistant Director Morris Bien as acting director. The chief counsel was in the office the entire month.

Delegations from a number of projects were in the office during the month to discuss plans for the relief of the water users with respect to repayments of charges and to present their requests to the Secretary.

Action was taken by the secretary on the following matters, among others, submitted to him:

Reporting adversely on Senate bill 2611, providing for an appropriation from the Treasury of \$4,000,000 for the construction of the San Carlos project, signed January 5, 1922.

Recommending that authority be granted to execute a contract with the State of Utah for a cooperative investigation of possibilities in Great Salt Lake Basin, under the direction of the Reclamation Service, the total expense not to exceed \$14,000, approved January 17, 1922.

Recommending that the time for accepting bids for the remainder of the unsold Yuma mesa lands be extended until all remaining units are sold, approved January 28, 1922.

Denver office.—Chief Engineer Weymouth and Engineer James Munn left Denver on January 22 for the Rio Grande project to join Mr. Henny in a board meeting on river protection south of El Paso. They returned on January 28. Assistant Chief Engineer C. P. Williams left Denver on January 21 for a visit to the Montana projects. Before the close of the month he had visited Huntley and Milk River projects.

The principal work accomplished in the Designing Division during the month consisted of the preparation of designs and estimates for flumes, Belle Fourche project; a review of the report of Project Manager Snell on the proposed Cut Bank extension, Blackfeet project; preparation of designs and drawings for gates and advertisement for miscellaneous material, Carlsbad project; preparation of designs for main canal, checks, and minor structures, Klamath project; advertisement and specifications for turnout gates and culvert, Lower Yellowstone project; the completion of preliminary estimate and final design for 100-foot abutment, American Falls Dam, Minidoka project; designs and estimates for repairs to tunnels, Newlands project; the completion and checking of designs for Browns Canyon Crossing, Fort Laramie Canal, North Platte project; tracing of two project maps, Riverton project; the preparation of designs of Willwood Diversion Dam and appurtenant structures, Shoshone project; the preparation of designs for South Canal structures and for diffusion chamber at Willow Creek Reservoir outlet, Sun River project; specifications for wooden pipe and weir gates and continuation of work on the designs for spillway and drum gates, Tieton Dam, Yakima project; preliminary design and estimate for Thief Valley Reservoir, Baker, secondary project; the preparation of preliminary designs and estimates for Black Canyon and Boulder Canyon Dams; and specifications for core drilling, Pecos River secondary project. Work was continued on the index of all secondary project maps in the Denver office, and on standard designs for lock-joint concrete-pipe culvert and precast structures.

The principal work accomplished in the Electrical Division during the month consisted of a revision of the foundation drawing for Thomas Point pumping plant and the completion of designs for penstock and discharge pipes, Lower Yellowstone project; the preparation of preliminary estimate of proposed American Falls power plant, Minidoka project; completion of preliminary report on cost of Fort Laramie pumping units, North Platte project; studies of proposed auxiliary water supply and plan of electrification of Government pumping plants, Okanogan project; consideration of various alternatives for purchasing power or construction of a Government plant and preliminary designs of the Pilot Butte power plant, Riverton project; studies of power development at Willwood Diversion Dam and the preparation of data sheets for Shoshone power plant, Shoshone project; the preparation of general arrangement drawing of B Lift pumping plant and data sheets covering equipment, Yuma project; preparation of estimates of cost of proposed power plants at Boulder and Black Canyon Dams. Work was continued on the drawings and illustrations for the outlet report and on the preparation of designs for electrification of draglines.—R. F. Walter.

Recent Reclamation Service Orders and Announcements.

CIRCULAR LETTERS.

- | | |
|-------|--|
| No. | |
| 1069. | Manual amendment. Authority to lease office rooms. |
| 1070. | Manual amendments. Irrigable areas. |
| 1071. | Special contract Form 7-707, use of, discontinued. |
| 1072. | Affidavits required for retirement act administration. |
| 1073. | Due date of operation and maintenance charges. |
| 1074. | Contracts for purchase of supplies for immediate delivery. |
| 1075. | Standard designs. |
| 1076. | Repayment collections, agitation for postponement. |
| 1077. | Red Cross aid to ex-service men. |
| 1078. | Disposition of old records. |
| 1079. | Employment of water users who are delinquent in their water charges. |
| 1080. | Use of scrip tickets. |

GENERAL ORDERS.

- | | |
|------|---------------------------|
| 272. | Cost and returns reports. |
| 272. | Federal Traffic Board. |

GENERAL LETTERS.

- | | |
|------|---------------------------------|
| 209. | Denver office standard designs. |
|------|---------------------------------|

Over 17,000 acres were devoted to the production of alfalfa hay on the Shoshone project in 1920. About 1,400 dairy cattle were reported in the same year.

ADMINISTRATIVE ORGANIZATION.

DEPARTMENT OF THE INTERIOR.

Hon. ALBERT B. FALL, Secretary of the Interior.
 EDWARD C. FINNEY, First Assistant Secretary.
 FRANCIS M. GOODWIN, Assistant Secretary.
 EDWIN S. BOOTH, Solicitor for the Interior Department.
 CHARLES V. SAFFORD, Administrative Assistant to the Secretary.
 CHARLES W. NESTLER, Administrative Assistant to the Secretary.
 HARRY G. CLUNN, Private Secretary to the Secretary.
 JOHN HARVY, Chief Clerk and Superintendent of Buildings.

U. S. RECLAMATION SERVICE.

WASHINGTON, D. C.

Arthur Powell Davis, director; Morris Bien, assistant director; Ottamar Hamele, chief counsel; J. B. Beadle, director's assistant; C. J. Blanchard, statistician; Hugh A. Brown, editor and office assistant; C. A. Bissell, engineer; C. A. Lyman, acting chief accountant; Miss H. A. Fellows and Raymond Depue, fiscal agents; C. H. Fitch, chief clerk; Emmet Carr, purchasing agent; G. W. Numbers, appointment clerk; H. N. Bickel, Yakima, Wash.; W. A. Meyer, Denver, Colo., and W. F. Kubach, Great Falls, Mont., examiners of accounts.

DENVER, COLO.

F. E. Weymouth, chief engineer, Tramway Building, Denver, Colo.; R. F. Walter and C. P. Williams, assistant chief engineers; Miss L. H. Meisel, secretary to the chief engineer; J. M. Gaylord, electrical engineer; J. L. Savage, designing engineer; James Munn, engineer; J. L. Burkholder, drainage engineer; J. M. Luney, chief clerk; A. McD. Brooks, purchasing agent; Harry Caden, fiscal agent.

FIELD LEGAL OFFICES.

Boise, Idaho.—B. E. Stoutemyer, district counsel. Projects: Boise, Minidoka, King Hill, and Jackson Lake Enlargement; R. M. Patrick, district counsel, located at American Falls, Idaho.

Denver, Colo.—Law section office of chief engineer: E. E. Roddis and Armand Offutt, district counsel.

El Paso, Tex.—P. W. Dent, district counsel. Projects: Rio Grande, Carlsbad, and Hondo.

Las Cruces, N. Mex.—Mark B. Thompson, attorney in charge of litigation on Rio Grande and Carlsbad projects.

Helena, Mont.—W. J. Eggleston, district counsel, Helena, Mont. Projects: Blackfoot, Flathead, Fort Peck, Huntley, Milk River, St. Mary Storage, Sun River, North Dakota Pumping, Lower Yellowstone, and Shoshone.

Mitchell, Nebr.—J. N. Beardslee, district counsel. Projects: North Platte and Belle Fourche.

Montrose, Colo.—J. R. Alexander, district counsel, Projects: Grand Valley, Uncompahgre, and Strawberry Valley.

Portland, Oreg.—H. L. Holgate and D. G. Tyree, district counsel. Projects: Yakima, Okanogan, Umatilla, and Klamath.

San Francisco, Calif.—Henry A. Cox and A. B. Fullerton, district counsel, 349 Pacific Building. Projects: Salt River, Yuma, Orland, and Newlands.

PROJECT ORGANIZATION.

Belle Fourche Project.—B. E. Hayden, project manager, Newell, S. Dak.; R. C. Walber, chief clerk; August Lewin, fiscal agent.

Boise Project.—J. B. Bond, project manager, Boise, Idaho; E. R. Mills, chief clerk; C. F. Weinlauf, fiscal agent.

Carlsbad Project.—L. E. Foster, project manager, Carlsbad, N. Mex.; V. L. Minter, chief clerk and fiscal agent.

Grand Valley Project.—S. O. Harper, project manager, Grand Junction, Colo.; C. H. Young, chief clerk; A. H. Hall, fiscal agent.

Huntley Project.—A. R. McGinness, project manager, Ballantine, Mont.; G. H. Bolt, chief clerk; Miss M. C. Simek, fiscal agent.

King Hill Project.—Walter Ward, project manager, King Hill, Idaho; T. W. Hause, chief clerk; L. D. Eakin, fiscal agent.

Klamath Project.—H. D. Newell, project manager, Klamath Falls, Oreg.; N. G. Wheeler, chief clerk; G. R. Barnhart, fiscal agent.

Lower Yellowstone Project.—L. H. Mitchell, project manager, Savage, Mont.; C. A. Denman, chief clerk.

Milk River Project.—G. E. Stratton, project manager, Malta, Mont.; H. A. Parker, engineer; E. E. Chabot, chief clerk; G. S. Moore, fiscal agent.

Minidoka Project.—Barry Dibble, project manager, Burley, Idaho; Dana Templin, engineer; E. C. Diehl, chief clerk; Miss A. J. Larson, fiscal agent; F. A. Banks, engineer, American Falls, Idaho.

Newlands Project.—J. F. Richardson, project manager, Fallon, Nev.; A. W. Walker, engineer; G. B. Snow, chief clerk and fiscal agent.

North Dakota Pumping Project.—W. S. Arthur, project manager and chief clerk, Williston, N. Dak.; H. C. Melaas, fiscal agent.

North Platte Project.—Andrew Weiss, project manager, Mitchell, Nebr.; H. W. Bashore, engineer, Fort Laramie Division; Paul Rothli, irrigation manager; J. R. Ummel, chief clerk; Miss A. L. Perrine, fiscal agent.

Okanogan Project.—Calvin Casteel, project manager, Okanogan, Wash.; W. D. Funk, chief clerk and fiscal agent.

Orland Project.—R. C. E. Weber, project manager, Orland, Calif.; E. T. Eriksen, engineer; C. H. Lillingston, chief clerk and fiscal agent.

Rio Grand Project.—L. M. Lawson, project manager, El Paso, Tex.; T. W. Parry, irrigation manager; C. A. Peavey, chief clerk; L. S. Kennicott, fiscal agent.

Riverton Project.—H. D. Comstock, project manager, Riverton, Wyo.; R. M. Conner, engineer; G. H. Murphy, chief clerk; J. C. Thraillkill, fiscal agent.

St. Mary Storage Division.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk; H. E. Bruce, fiscal agent.

Salt River Project.—Being operated by the Salt River Valley Water Users' Association; C. C. Cragin, general superintendent and chief engineer, Phoenix, Ariz.

Shoshone Project.—J. S. Longwell, project manager, Powell, Wyo.; J. R. Iaklsch, engineer; C. M. Jump, superintendent of irrigation; W. F. Sha, chief clerk; Miss L. C. Drinkwalter, fiscal agent.

Strawberry Valley Project.—W. L. Whittemore, project manager, Provo, Utah; J. E. Overlade, chief clerk and fiscal agent.

Sun River Project.—G. O. Sanford, project manager, Great Falls, Mont.; H. W. Johnson, chief clerk; Miss M. G. Valentine, fiscal agent; G. A. Benjamin, irrigation manager, Fairfield, Mont.

Umatilla Project.—H. M. Schilling, project manager, Hermiston, Oreg.; G. C. Patterson, chief clerk and fiscal agent.

Uncompahgre Project.—L. J. Foster, project manager, Montrose, Colo.; A. H. Peach, chief clerk and fiscal agent.

Yakima Project.—J. L. Lytel, project manager, Yakima, Wash.; R. K. Cunningham, chief clerk; J. C. Gawler, fiscal agent; M. D. Scroggs, superintendent of irrigation, Sunny-side, Wash.; J. S. Moore, superintendent of irrigation, Route 6, Yakima, Wash.; F. T. Crowe, engineer in charge construction Tilton Dam, Rimrock, Wash.; C. E. Crownover and C. F. Gleason, engineers; V. G. Evans, chief clerk; C. B. Funk, fiscal agent.

Yuma Project.—P. J. Preston, project manager, Yuma, Ariz.; R. M. Priest, superintendent of construction; S. A. McWilliams, engineer, Yuma Mesa Division; E. R. Scheppelmann, chief clerk; E. M. Philebaum, fiscal agent.

INDIAN PROJECTS.

Blackfoot Project.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk and fiscal agent.

Flathead Project.—C. J. Moody, project manager, St. Ignatius, Mont.; J. M. Swan, chief clerk; J. P. Siebeneicher, fiscal agent.

Fort Peck Project.—S. A. Kerr, project manager, Poplar, Mont.; Henry Berryhill, chief clerk and fiscal agent.

The Reclamation Record

An ADMINISTRATIVE and STATISTICAL REPORT

Issued Monthly by the RECLAMATION SERVICE, DEPARTMENT OF THE INTERIOR, Washington, D. C.

CERTIFICATE: By direction of the Secretary of the Interior the matter contained herein is published as administrative (or statistical) information and is required for the proper transaction of the public business.

VOLUME 13, No. 3

MARCH, 1922

REPORT ON HYDRAULIC PROBLEMS OF THE COLORADO RIVER.

THE control of the floods and development of the resources of the Colorado River are peculiarly national problems for several reasons:

1. The Colorado River is international.
2. The stream and many of its tributaries are interstate.
3. It is a navigable river.
4. Its waters may be made to serve large areas of public lands naturally desert in character.
5. Its problems are of such magnitude as to be beyond the reach of other than national solution.

The study of the Colorado River Basin from the standpoint of its use in irrigation and otherwise may be said to have begun by the establishment of stations for the measurement of stream discharge in various parts of the basin in 1894 and 1895 by the United States Geological Survey. One of these stations was established at Yuma, Ariz., to intercept and measure the discharge of the entire stream, there being no tributaries below this point.

After the passage of the reclamation act in 1902 the Reclamation Service took up the systematic study of the lower river, provided for more frequent and systematic gagings at Yuma and other points, and made a topographic survey of the lower valleys of the Colorado River from Bulls Head to the Mexican boundary. The investigations were continued, particularly as regards stream measurements and the survey of reservoir sites and borings at the necessary dams. In the stream-measurement work substantial cooperation was extended by the Geological Survey and the results were assembled in the publications of that bureau from time to time.

A more intensive study of the entire basin was inaugurated in 1914 by a special allotment of \$50,000 for this purpose, supplemented by annual allotments in subsequent years, and this work was finally assembled in three large volumes of manuscript by Mr. John T. Whistler. It includes a reconnaissance of practically all of the proposed reservoir sites and irrigation projects in the basin above the Arizona line and the compilation of all existing data including the water filings and water rights throughout the basin. The study did not stop with the rendition of Mr.

Whistler's report, but was transferred to the lower basin where the topographic survey of the basin was continued up the river from Bulls Head and a detailed survey made of the proposed reservoir site at and above Boulder Canyon.

Recent investigations have been carried on under authority of the act of May 18, 1920 (41 Stat., 600), sometimes known as the Kinkaid Act, and a report by Director A. P. Davis has just been transmitted to Congress by Secretary Fall.

PHYSIOGRAPHIC FEATURES.

The Colorado River is formed by the junction of the Grand¹ and Green Rivers in southeastern Utah. Its length from the junction of the Green and the Grand to the Gulf of California is about 1,050 miles, thus making, with the continuation of the Green, 1,750 miles in length.

The drainage area of the Colorado River is 244,000 square miles, distributed as shown in the accompanying table, which also shows the water supply from the various branches:

Average discharges.

	Per cent of total discharge.	Discharge in acre-feet.	Square miles.	Per cent of total square miles.	Acre-feet per square mile.
Green River.....	32	5,510,000	44,000	18	125
Upper Colorado (Grand River).....	40	6,940,000	26,000	11	267
San Juan River.....	14	2,700,000	26,000	11	104
Other areas except Gila.....	8	1,560,000	91,000	37	17
Gila.....	6	1,070,000	57,000	23	19
Total.....	100	17,780,000	244,000	100	73

SILT-DEPOSIT DATA.

Observations of silt carried have been taken periodically at Yuma just below the mouth of the Gila

¹ Recent action of the United States and of Colorado and Utah has changed the name from "Grand" to "Colorado."

River for a long series of years and show an average annual amount by volume of 113,000 acre-feet, on the assumption that 85 pounds of dry matter is equivalent to a cubic foot of solid.

The silt content of the Colorado, with the Gila not in flood, has averaged about one-half of 1 per cent and this is fairly representative of the silt conditions at Boulder Canyon reservoir. The discharge at Boulder Canyon is estimated at 17,500,000 acre-feet annually. On this basis the average annual silt discharge is about 88,000 acre-feet per annum.

URGENCY OF RELIEF.

In the valleys of the Lower Colorado, and especially the Imperial Valley, storage is needed for the extension of irrigation and for safety against drouth of the areas already irrigated when the cycle of low years rolls around.

The need is also vital for protection from floods of the Colorado which threaten the levees along the river valley and which are a constant menace to the Imperial Valley, threatening a repetition of the experience of 1906. Both of these problems are urgent and vital.

The records of the Imperial Irrigation system show that for a considerable period in 1915 the waters of the Colorado River were all, or practically all, diverted at the intake of that canal and applied in irrigation of Imperial Valley, with the result that an actual shortage existed there part of the time. The shortage was not severe nor disastrous but it had a value as indicating the actual state of the water supply in relation to use. The shortage would have been still greater had a period as low as that of 1902 and 1903 occurred at that time.

Since 1915 there has been considerable improvement in the application of water in the Imperial Valley, but recent experience shows that storage is needed to supplement the low-water flow before any large irrigable areas can be added.

Project.	Irrigated acreage.		
	1915	1920	Ultimate.
Imperial District.....	336,000	415,000	515,000
Mexico.....	40,000	190,000	(?)
Yuma.....	28,000	54,000	120,000
Palo Verde.....	20,000	35,000	78,000
Grand Valley project.....	.....	13,000	53,000
Uncompahgre project.....	50,000	70,000	110,000
Total.....	474,000	777,000	.....

Since 1915 Imperial Valley has increased its irrigated area over 60,000 acres in the United States and about 150,000 acres in Mexico. The Imperial Irrigation District contains more than 100,000 acres of irrigable land not yet irrigated and the same valley in

Mexico can increase over 40,000 acres and is in a physical position to take the necessary water from the Imperial Canal before it reaches the California line.

Assembling the more important of the known data, we have the accompanying table showing increase throughout the basin over 1915.

This table indicates that the increased irrigation in the basin in 1920 over 1915 is about 300,000 acres and that the desired expansion in the Imperial Irrigation District and incontestable or unpreventable expansion in other regions will bring this acreage up to 877,000 acres, or about 400,000 acres more than in 1915, besides the various increases in the Upper Basin.

For full development of all the lands that can be reached by gravity and reasonable pumping lifts on the Lower Colorado River large storage capacity will be required, estimated at about 11,000,000 acre-feet if provided by a reservoir below the Grand Canyon in the Colorado. If storage is provided above the Canyon, this must be increased by at least 2,000,000 acre-feet on account of the unavoidable losses due to the impossibility of regulating the flow in exact accordance with the needs of irrigation from a reservoir so far distant, and for other reasons.

To remove the menace of flood from the Colorado River will require a much larger storage capacity than that above given.

The floods divide themselves naturally into two general classes, those from the Colorado River, which drains large areas in Wyoming, Colorado, New Mexico, Utah, and Arizona, and those from the Gila, which lies mostly in Arizona and partly in New Mexico and Mexico.

A reservoir site of 2,200,000 acre-foot capacity has been investigated near Sentinel, on the Lower Gila, which, if built and maintained, would practically eliminate the menace from the floods of the Gila, but the investigations show such poor conditions for foundation and abutments that the feasibility of this reservoir is subject to doubt.

The control of the Colorado River proper is, however, the main element involved in the flood menace of the lower river, and this has been investigated extensively.

Possible reservoir sites have been found on the Grand and the Green Rivers which, if constructed and operated for the purpose of flood protection, would greatly reduce the volume of the floods, for though the areas intercepted by each are small compared with the total area of the Colorado River Basin they drain mountains with high precipitation that furnish a relatively large volume of water. A reservoir site also exists on the San Juan River, which is the next tributary of importance, but the feasibility of this has not been established.

Of the total area drained by the Colorado River—244,000 square miles—96,000 square miles are drained by the Grand, the Green, and the San Juan, which,

though draining less than two-fifths of the total area, furnish approximately 84 per cent of the total water supply. There is still, however, an area of nearly 100,000 square miles below these rivers, exclusive of the Gila, which would be uncontrolled by such reservoirs. These areas, though furnishing a relatively small quantity of water, owing to their aridity, are yet of such extent and declivity that they furnish occasional floods of magnitude from direct precipitation, due to which their control is important from the standpoint of the flood menace.

In the study of this problem, it has been demonstrated that for several reasons it is desirable to have a reservoir below the Grand Canyon of the Colorado, which will intercept most of the drainage of the Colorado River and therefore be a more complete solution of the flood-control problem. This method of control is still more vital for other reasons.

The large areas of very fertile and valuable lands now developed and being rapidly developed require immediate relief by extension of storage for irrigation, and if such storage is constructed in the upper basin, it will of course be operated in conformity with the requirements of irrigation in the lower valley as nearly as this can be predicted, but a large percentage of the water will be lost owing to the great distance and the impossibility of predicting the exact requirements a month or more ahead. In order to provide against embarrassing shortage, it will be necessary to turn out at all times sufficient water to provide for the most extreme conditions that may occur, but which seldom do occur, and this will mean that nearly all the time a large amount of water will be flowing to waste. A large part of this waste can be obviated by an adequate reservoir on the lower river.

In addition to the above waste, any water supply appropriated above for use in the lower valley would not be available for irrigation in the upper valley. The most feasible sites occur at points where this would be an objection to such use, because it would leave in an arid state lands that might otherwise be irrigated in the upper basin. Such a result would be a distinct waste of resources, as investigations show that there is a sufficient quantity of water to furnish an adequate supply to all of the lands in the basin that can be feasibly reached by gravity or reasonable pumping lifts. There will, of course, be local exceptions to this where the areas can be reached only by tributaries in which the local supply is insufficient, but this is aside from the main question.

In addition to the above waste, the regulation of waters from the upper river in accordance with irrigation needs in the lower valley would be distinctly out of harmony with the best use of these waters for power in the canyon regions where the power resources predominate.

In the upper and lower regions of the Colorado Basin irrigation interests should and must predominate, although power resources are very important. In the middle or canyon region of the basin, power resources predominate and irrigation interests are small. In general, where irrigation interests are practicable, they should be given preference over power interests, and this rule requires storage of water in Boulder Canyon, or below, for the use of the lower valleys. The States in the upper basin are therefore vitally interested in seeing that such development takes place before the natural resources are depleted by storage above for use in the lower valleys.

Likewise the States containing the lower valleys are interested in having storage in the lower basin on account of the economies thereby obtained and the greater convenience and ease of control of a reservoir near the point of use. Incidentally, it will have large power resources, which are important in the development of the resources of the Southwest.

Recognizing the importance of developing the Colorado Basin on broad lines in such a way as to realize the greatest benefits therefrom, the States of the Colorado River Basin have taken steps to organize a commission, upon which the Federal Government and each of the seven States interested are represented, in order to work out and recommend to their respective States and Congress such action as will bring about the best use of the water resources of this great river system, the largest and most important river system lying entirely within the arid region.

Fortunately, the investigations at Boulder Canyon have shown the feasibility of a high dam at that point, which if built would furnish storage as shown in the accompanying table:

Capacity table—Boulder Canyon Reservoir.

[Computed from original plane-table sheets; scale, 2 inches equals 1 mile.]

Contour elevations.	Area.	Capacity.	Contour elevations.	Area.	Capacity.
	<i>Acres.</i>	<i>Acre-feet.</i>		<i>Acres.</i>	<i>Acre-feet.</i>
700.....			1,100.....	67,740	10,153,000
750.....	2,350	58,750	1,150.....	84,110	13,949,250
800.....	7,950	316,250	1,200.....	105,160	18,679,500
850.....	15,620	846,500	1,250.....	127,660	24,498,500
900.....	21,620	1,818,500	1,260.....	131,000	26,000,000
950.....	29,160	3,083,000	1,280.....	142,000	28,600,000
1,000.....	39,690	4,609,250	1,300.....	152,000	31,600,000
1,050.....	53,160	7,130,500			

NOTE.—The canyon walls extend up to above the 2,000-foot contour, or about 700 feet higher than the last one for which capacity is calculated.

PROGRESS OF INVESTIGATIONS.

The preliminary report on the problems of Imperial Valley and vicinity, published in January, 1921, described the progress of investigations up to that date, and these have been continued up to the present time.

Soil surveys under the direction of Prof. Charles F. Shaw have been prosecuted and land classification based upon this examination has been made.

Borings have been prosecuted at the proposed dam site in Boulder Canyon and the cross section of the canyon has been fairly well worked out. A large amount of additional borings is, however, necessary to develop the entire foundation of the proposed dam and this will probably modify its location. Similar information is also necessary for the cofferdam which must precede the main construction, and must be, for temporary work, of a rather substantial character. Results of the borings indicate the maximum depth to bedrock of about 135 feet below low-water level. This is regarded as feasible, although the foundation work will of course be difficult and expensive in view of the great volume of the river when in freshet.

Various studies have been made on the basis of the information available and these studies indicate the cost of a dam, with flow line at 1,230 feet, to be about \$45,000,000. This would have a storage capacity of about 21,000,000 acre-feet. Increased height of dam to provide greater storage can be provided at an additional cost of about one dollar per acre-foot for the next 10,000,000 acre-feet. A capacity of 31,000,000 acre-feet would require a flow line at about 1,296 feet above sea level.

These figures include preliminary work and the completion of the dam in shape to serve for storage purposes and upon which to install power plants, but do not include any other cost of power development or transmission.

A reconnaissance has been made for two possible railroad lines—one approaching from the west and joining the Salt Lake & Los Angeles Railroad near Las Vegas; the other approaching from the north, being a continuation of the branch which runs from Moapa to St. Thomas. A reconnaissance should be made also with a possible connection with the Santa Fe system to the south, with a comparison of the cost and results.

THE HIGH-LINE CANAL.

The construction of a high-line canal connecting Laguna Dam with Imperial Valley was investigated and reported upon by a board representing the State of California, Imperial Irrigation District, and the United States, under date of July 22, 1919, and was published under the title, "Report of the All-American Canal Board. A canal located entirely within the United States from the Colorado River at Laguna Dam into the Imperial Valley, California." Reference is made to that report for the details of such a plan.

POWER DEVELOPMENT.

The development of power at the Boulder Canyon reservoir is a by-product, which does not in all respects conform to the requirements of irrigation, but can be made to conform thereto with some adjustments. The extremely arid and semitropic character of the lands in the Lower Colorado Basin makes it

necessary to irrigate throughout the year, and the irrigation requirements therefor conform more nearly to the requirements for power than do those in northern latitudes.

It is estimated that the feasible irrigation projects in the lower basin, which would divert water from the main stream, comprise 2,020,000 acres, of which about 60 per cent is in the United States and 40 per cent in Mexico. The full development of the proposed projects in the upper basin will subtract substantially from the total water supply, but there will still be left ample water to irrigate all the lands of the lower basin if it is conserved and regulated in a storage reservoir of ample capacity. With 1,505,000 acres of land in the lower basin irrigated and with a total storage capacity at Boulder Canyon of 31,400,000 acre-feet, of which the lower 5,000,000 is reserved for silt storage and the upper 5,000,000 is reserved for flood control, it is possible to develop over 700,000 firm horsepower. With the entire 2,020,000 acres of irrigable land developed in the lower basin the possibilities are still 600,000 firm horsepower, and besides this there is a large amount of secondary power which is not constant but will be of considerable value.

All this is on the assumption that the total area of irrigable land in the upper basin is irrigated, namely, about 4,000,000 acres, of which about three-eighths is now under ditch. The development of the upper basin will doubtless proceed steadily, but it will be a long time before the full development is reached and the water later to be consumed by future irrigation will be available for power at Boulder Canyon until that development is realized. This will greatly increase the figures shown above for a long time to come and, in the meantime, any regulation of the river above for any purpose will also tend to increase them.

The great value of this power and the wide demand for it, together with its magnitude, indicate that the power privileges of the Boulder Canyon reservoir can be made to bear the entire cost of the dam.

RECOMMENDATIONS.

At the conclusion of the report above referred to, which was recently transmitted to Congress, the following recommendations are made:

1. It is recommended that through suitable legislation the United States undertake the construction with Government funds of a high-line canal from Laguna Dam to the Imperial Valley to be reimbursed by the lands benefited.
2. It is recommended that the public lands that can be reclaimed by such works be reserved for settlement by ex-service men under conditions securing actual settlement and cultivation.
3. It is recommended that through suitable legislation the United States undertake the construction with Government funds of a reservoir at or near Boulder Canyon on the lower Colorado River to be reim-

bursed by the revenues from leasing the power privileges incident thereto.

4. It is recommended that any State interested in this development shall have the right at its election to contribute an equitable part of the cost of the construction of the reservoir and receive for its contribution a proportionate share of power at cost to be determined by the Secretary of the Interior.

5. It is recommended that the Secretary of the Interior be empowered after full hearing of all concerned to allow the various applicants their due por-

portion of the power privileges and to allocate the cost and benefits of a high-line canal.

6. It is recommended that every development hereafter authorized to be undertaken on the Colorado River by Federal Government or otherwise be required in both construction and operation to give priority of right and use—

1. To river regulation and flood control;
2. To use of storage water for irrigation;
3. To development of power.

—C. A. Bissell, Engineer, U. S. R. S.

REPORT ON CLOSING 42-INCH OUTLET PIPES IN SHOSHONE DAM.

THE Shoshone hydroelectric power plant, now under construction, is located in the Shoshone River Canyon a short distance below the Shoshone Dam, 8 miles west of Cody, Wyo.

The Shoshone Dam, which forms the storage reservoir for the lands of the Shoshone project is a rubble concrete arch, 328 feet high, 200 feet long on the crest, 108 feet thick at the base, and 10 feet thick at the crest. The height above river bed is approximately 233 feet. At the elevation of the spillway, 10 feet below the crest of the dam, the storage capacity of the reservoir is 456,600 acre-feet. The dam was completed in 1910.

The plant is to obtain water through a penstock connected with the reservoir, and the head on the plant will therefore depend on the height of water in the reservoir and will vary from 100 to 240 feet. As now planned, the ultimate capacity of the plant will be approximately 5,400 horsepower at 140-foot head and will consist of three units, two of 1,100 horsepower and one of 3,200 horsepower. The building is being built for final development, but only the two 1,100-horsepower units will be installed at the present time. The plant is being constructed primarily for supplying electric energy for the operation of excavating equipment on drainage and canal construction and for the operation of construction plants in connection with future extensions of the project. Incidental to this use for construction, power will also be supplied to the various towns on the project and in the vicinity of the project.

Water is to be taken from the reservoir through the two 42-inch pipes located in the dam—at stream-bed elevation—installed at the time of constructing the dam. Two 48-inch mechanically operated balanced valves for emergency use will be located at the outlet of the present 42-inch pipes. These valves will connect to two riveted steel penstocks which immediately after leaving the valves swing to the left and enter a tunnel in the canyon wall. The pipes extend about 50 feet into the tunnel, where they connect to two 60-inch semisteel tunnel linings 10 feet long, embedded in concrete. From the two tunnel linings there is a

concrete transition 10 feet in length to the concrete-lined tunnel section. The tunnel proper is an 8-foot 6-inch horseshoe section and has a length of 424 feet. At its lower end is located a concrete transition, 10 feet long, connecting the horseshoe section to a 96-inch semisteel tunnel lining. The semisteel tunnel lining is 10 feet long and incased in concrete. A 96-inch riveted steel pipe connects to the tunnel lining and extends about 50 feet to the lower portal, where it swings to the left and enters the power house. Outlets are provided in the pipe to furnish water to the three units. The pipe decreases in size in going through the power house from 96 inches to 48 inches. From the downstream wall of the building the pipe swings to the right and extends about 50 feet to the by-pass valve house, where the pipe connects with a 42-inch motor-operated gate valve, which valve in turn connects to a 36-inch hydraulically operated balanced needle valve. The needle valve is set on an angle of $13\frac{1}{2}^{\circ}$ with the horizontal and will discharge directly into a short tunnel, the outlet end of which tunnel is below water surface in the river. This manner of discharge is to prevent spray, which would result were the by-pass discharged directly into the river.

42-INCH PIPES THROUGH DAM.

The two lines of 42-inch cast-iron pipe through the dam were originally controlled by two 30-inch gate valves on each line of pipe located in a gate house on a concrete bracket at the downstream face of the dam. Trouble was, however, experienced in operating these valves, and shortly after their installation both valves were torn off of the south pipe and the lower one torn off of the north pipe. At the time the valves were torn off the water also destroyed the lower portions of the gate house.

At the time work was commenced on the power plant the south pipe was discharging free and there was a small flow through the north pipe, as the one remaining valve was not entirely closed.

The cast-iron pipes through the dam have bell and spigot connections, except the next to the last sections

which were flanged on the downstream end and the last sections which were flanged on both ends. These pipes are located on radial lines through the dam. To make the connection between the pipe in the dam and the valves, the last sections of both 42-inch pipes have been removed and replaced with semisteel pipes expanding from 42 inches in diameter at the upper end to 48 inches in diameter at the lower end. The 48-inch emergency valves are connected at the lower end. These pipes are so designed as to bring the valves parallel instead of on radial lines.

In order to remove the two sections of 42-inch pipe in the dam, install the new pipe and valves, and make the connection with the tunnel, it was necessary to shut off the flow of water through both 42-inch pipes. There are two sets of vertical grooves or guides in the concrete at the inlet end of the pipes. In one set of the grooves, in front of each pipe, there were placed structural steel trash racks. The other set of grooves was for placing stop planks, in order to cut off flow through the pipes after emptying the reservoir.

At the time it was decided to construct the power plant the water surface in the reservoir was at elevation 5,360, representing a storage of 456,600 acre-feet and a depth over the 42-inch pipes of 226 feet. To empty the reservoir through the two 58-inch Ensign balanced valves in the south outlet tunnel would have required about three months and might have resulted in a water shortage in the spring of 1922. Further complications might have developed in the nature of damage claims on account of turning out more than the natural flow and causing overflow in the lower reaches of the river. On account of these conditions it was decided to remove the trash racks under more than 200 feet of water by grappling them with hooks and to plug the inlet end of the 42-inch pipes with wooden balls filled with concrete.

REMOVAL OF TRASH RACKS.

A 1½-inch cableway was erected across the canyon above the dam, a short distance upstream from the inlet to the pipes. Heavy hooks made from 1½-inch steel, consisting of two V-shaped bars with hooks at the points, bolted back to back, thus giving four hooks, were constructed for use in grappling the racks. The first effort to remove the racks was made in the latter part of December, 1920. The hooks were lowered from the cableway in front of the south pipe. No trouble was experienced in hooking the rack, but although pulling with a 30-horsepower hoist engine through a 9-part line attached to the cableway and with the cableway stressed beyond the safe load, we were unable to move the rack. The hook was disengaged frequently and the rack hooked again in a different place in an effort to loosen it and to try to locate the proper place for pulling. After breaking several hooks larger steel was used, and from time to

time the size was increased until the last ones used were made from 3-inch material. Several cables were broken between the hook and the block on the 9-part tackle and a number of hooks lost.

After the failure of continued efforts to remove this rack with the cableway, a barge was constructed, designed to withstand a 50-ton pull with jacks. The cable was brought up through a pipe in the center of the barge. It was planned to use this barge and the cableway at the same time, pulling with two lines.

While the barge was being constructed the carriage on the cableway was moved over, the hook lowered, and the north rack engaged. After persistent effort and the breaking of several hooks, the north trash rack was raised approximately 10 feet and the hook disengaged. The depth of water at that time—January 20, 1921—was 200 feet.

After raising the rack in front of the north pipe we hooked onto the south rack pulling with both the cableway and the jacks on the barge, but repeatedly broke the heavy steel hooks without moving the trash rack. Finally, on January 30, 1921, after breaking a hook by pulling with the jacks on the barge, we hooked onto the rack, using the hook from the cableway, with a 9-part line and succeeded in raising the screen the proper distance. Apparently in previous efforts we had not been able to hook the rack at the proper place to enable us to pull it up in the guides. The discharge through the south pipe at the time of removing the rack was 630 second-feet and the head on the pipe 198 feet.

PLACING WOODEN BALLS IN PIPES.

Having removed the racks, large wooden balls were constructed for use in closing the pipes. These balls were 5 feet 6 inches in diameter and consisted of a wooden shell, well bolted, filled with concrete. They were designed to fit into the bell-mouthed pipe inlets and their weight was approximately 6,200 pounds.

One of the balls was covered with canvas about 1 inch thick and lowered on the cableway a short distance in front of the south pipe, the cable being pulled out to keep the ball away from the inlet. When the ball had been lowered to about the level of the inlet the cable was released and the ball was carried by the current into the pipe inlet. The depth of water was, on this date—February 3, 1921—197 feet, and the discharge through the south pipe 630 second-feet. The ball caught in the current and went into the pipe entrance with such force that the impact could be felt on top of the dam. An examination at the outlet end of the pipes, although submerged, showed that an effective closure had been made, as there was apparently very little leakage around the ball. Later, after the cofferdam below the pipe outlets had been pumped out, we found the leakage through this pipe to be a little over 1 second-foot.

This leakage, as was found from an examination of the ball from the inside of the pipe, was caused by a crushing of the timbers in one or two places when the ball hit the dam.

After closing the south pipe a second ball was lowered to effect a closure of the north pipe. The ball, however, would not go into place, and it was assumed that there was not sufficient flow through the pipe and remaining valve—partially open—to pull the ball into the inlet. The ball was raised and an effort was made to open the valve and increase the flow; the stem had, however, apparently been broken loose from the gate and it could not be opened. A charge of dynamite was then placed in the valve and the valve shot off. This allowed the pipe to discharge free under reservoir pressure.

The north pipe now being open, the ball was lowered again. The ball pulled in against the dam and materially reduced the flow through the pipe to what was estimated as 75 second-feet. A pull was made with the cable to try and effect a more satisfactory closure. Instead of stopping the flow, however, it was increased to about the same amount that was discharging before the ball was lowered. A second pull was then made with the cableway and both cables fastened to the ball and the line from the cableway came up, leaving the ball in the bottom of the reservoir. One of the cables fastened to the ball was torn in two; the other was looped as fastened to the ball. Investigation with hooks on the line from the cableway indicated that the trash rack was again down in front of the opening. It appears that the ball must have come in contact with the trash rack and caused it to slide back in place. The ball resting against the rack probably reduced the flow as observed and the first pull on the ball probably slid it up on the screen, increasing the flow. The cable may have been cut when the ball hit the screen or torn in sliding on the screen. The rods to which the cable was fastened projected a short distance from the periphery of the ball, and it seems very probable that these rods came in contact with the rack, were broken off and allowed the other cable fastened to the ball to become loose with the second pull on the ball.

After losing the ball, sharp-pointed hooks were lowered and an effort was made to hook the ball and roll it to one side. No success was attained from this method. A large net made of cable and iron rods was then constructed and lowered from the 9-line tackle on the cableway. After several days' work the ball was apparently caught, but the cable broke in attempting to raise the ball. A hook was then lowered, the net caught, pulled loose from the ball, and raised to the surface. An examination showed that the net had doubtless been in contact with the ball, as pieces of canvas and wood were found on the cable and irons of the net. A new net was then made and with new and heavier cable on the line from the cableway the

net was lowered again for catching the ball. Several days were spent in fishing for the ball and finally it was caught, but we were unable to loosen it from the rack. Several charges of dynamite were exploded near the ball and then on March 16, 1921, pulling with the hoist engine through a 9-part line fastened to the cableway and a 5-part line attached to the parapet wall of the dam, the ball was loosened and raised to the surface. The depth of water at this time was 189 feet.

By the use of the hooks again, the north trash rack was caught and on March 23, 1921, it was pulled completely out of the guides and brought to the surface.

A third ball of different design as regards bolts for connection to the cable was now constructed. In this case there were no projecting rods, instead a U bolt was used, the top of which was practically flush with the periphery of the ball. This ball was filled with concrete, covered with canvas, and then lowered in front of the north pipe. The ball, however, would not go into the pipe, although the discharge through the pipe was over 600 second-feet, so it was brought back to the surface. Hooks were again lowered and an effort made to determine what sort of an obstruction was holding the ball away from the pipe. We were able to hook onto something, but could raise it but a short distance when it would slip off the hooks. Several hooks were broken in this work. On April 2, 1921, after having caught some obstruction and raised it a few feet and then lost it, observers noted that the flow through the pipe had increased. Examination of the automatic gauge at the rating station below showed that the flow had increased some 30 second-feet. It was assumed that the obstruction had been removed and a box as large as would pass through the pipe was lowered, filled with rock. It passed through the pipe and it was apparent that now everything was clear. On April 3, 1921, the ball was again lowered, the current pulled it into the opening and it seated immediately. The flow through the pipe was cut off so that no motion could be detected at the outlet. Later, after pumping out the cofferdam, the leakage around the ball was found to be slightly less than 1 second-foot.

The closure of the two pipes through the dam permitted work to be commenced on the construction of a cofferdam below the outlet of the pipes. After the valves are installed and the connections made with the tunnel, the valves will be closed. The pressure will then be allowed to build up in the pipes until there is no head on the balls, at which time they will be removed. The balls are now fastened to the parapet wall on the dam by means of 1-inch cable.

R. V. Sass is superintendent of construction on the power plant; H. F. McPhail is assistant engineer; and Michael Wagner was foreman on the work in connection with the closure of the pipes.—*J. S. Longwell, project manager.*

STATISTICS CONCERNING SOME OF THE RESULTS OF IRRIGATION ON THE MILK RIVER PROJECT, MONTANA.

THE accompanying tabulation shows some of the results in 1921 of irrigation on the Milk River project.

Owing to the fact that the project comprises a comparatively small area of irrigated land, surrounded by a much larger area of dry farm land which makes large contributions to the shipments of agricultural products, and also purchases a large amount of the products of manufacture, not all the values included in the table can, of course, be attributed directly to reclamation. However, the figures are significant as showing some of the results accomplished by reclamation and the relationship of these irrigated areas and their tributaries to eastern manufactures.

Value of crops produced in 1921.

	Dry farmed.	Farmed under irrigation.
Exclusive of Chinook Division:		
Alfalfa.....	\$16,500	\$31,500
Corn.....	10,000	6,000
Flax.....	2,500	800
Garden.....	8,800	5,100
Hay (other than alfalfa).....	18,100	35,500
Oats.....	14,100	10,800
Potatoes.....	11,700	5,700
Wheat.....	59,600	34,300
Miscellaneous.....	700	300
Total.....	142,000	130,000
Chinook Division.....		228,000
Total for project.....	142,000	358,000
Value of crops produced since 1915 (actual census), exclusive of Chinook Division.....		
	581,000	1,802,000
Value of crops, Chinook Division, since 1919.....		
		1,020,000
Total.....	581,000	2,822,000

Assessed valuations (exclusive of Chinook Division).

Farms.....	\$864,000
Irrigable land, unoccupied.....	70,000
Towns.....	1,630,000
Public utilities.....	2,450,000
Total.....	5,014,000

Values created (exclusive of Chinook Division).

Value of farm lands and improvements on project estimated by the owners at close of 1921.....	\$2,800,000
Value of irrigable land unoccupied.....	200,000
Value of live stock.....	312,000
Value of farm equipment.....	192,000
Total.....	3,504,000

Shipments of agricultural products, 1921¹ (exclusive of Chinook Division).

	Cars.
Hay.....	233
Flax.....	56
Cattle.....	417
Horses.....	10
Sheep.....	156
Wheat.....	1,131
Oats.....	2
Flour.....	81
Miscellaneous.....	103
Total.....	2,189

Wholesale purchases of manufactures during 1921² (exclusive of Chinook Division).

Dry goods, clothing, etc.....	\$410,000
Lumber.....	206,000
Automobiles, trucks, etc.....	210,000
Groceries.....	\$340,000
Hardware.....	105,000
Coal, feed, flour, and bags.....	308,000
Farm implements.....	72,000
Machinery and supplies.....	14,000
Electrical supplies.....	19,000
Jewelry and miscellaneous instruments.....	5,000
Drugs and sundries.....	121,000
Cigars, etc.....	75,000
Furniture.....	24,000
Other merchandise.....	95,000
Total for year.....	2,504,000

Other significant statistics, 1921.

Number of farms.....	³ 280
Number of towns.....	⁴ 11
Population.....	⁵ 7,800
Acres supplied with water.....	³ 16,384
Acres in crop.....	³ 16,093
Public schools.....	³ 20
Churches.....	⁴ 25
Newspapers.....	³ 10
Banks.....	⁴ 24
Capital stock.....	⁴ \$825,000
Deposits.....	⁴ \$3,562,000
Number of depositors.....	⁴ 12,500
Industries:	
Creameries.....	1
Flour mills.....	2
Planing mills.....	1
Soft drinks.....	1
Railroads, miles.....	102

¹ Includes not only shipments from project, but also for a dry-land area surrounding the project.

² This list also includes purchases for the large dry-land area surrounding the project, as well as for project lands proper.

³ Exclusive of Chinook Division.

⁴ Including Chinook Division.

⁵ Deposits are received from a large area not included in the project.

RECLAMATION LAW NOTES.

Use of Waste and Seepage Waters.

In *United States v. Haga* (276 Fed. 41), a case arising in connection with operations by the Government on the Boise Federal irrigation project in Idaho, the United States District Court for the Southern Division of that State holds as follows, regarding the use of waste and seepage waters:

An appropriator who has diverted water and devoted it to irrigation purposes is entitled to its exclusive control so long as he is able and willing to apply it to beneficial uses, and such right extends to what is commonly known as wastage from surface run-off and deep percolation necessarily incident to practical irrigation; nor is it essential to his control that he maintain continuous actual possession of such water, but so long as he does not abandon it or forfeit it by failure to use and can identify it he may assert his rights.

Comp. St. Idaho, sections 5556, 5558, providing that all of the waters of the State when flowing in their natural channel are the property of the State and that the right to the use of waters of rivers, streams, etc., may be acquired by appropriation, do not apply to wastage water from an irrigation system though flowing in the natural channel of a stream.

Comp. St. Idaho, section 5562, providing that "all ditches * * * constructed for the purpose of utilizing seepage, waste, or spring water of the State, shall be governed by the same laws applicable to ditches * * * constructed to utilize waters of running streams," has relation only to public waters of the State subject to appropriation, and does not authorize the construction of ditches to utilize seepage or waste water rightfully under the control of another.

Defendant for irrigation of his land diverted water from a creek which had a natural flow only during early spring, the water which it carried later being overflow and seepage from lands irrigated in part by water owned by an irrigation company which had abandoned such wastage, and in part from lands under an irrigation project of the United States which had not abandoned its wastage. *Held*, that defendant was entitled to the use of the natural flow and of the wastage from the irrigation company lands, but that the Government was entitled to such share of the later flow as could be determined as coming from the lands within its project.

Traveling Expenses of Government Employees.

When there is a mingling of private matters with Government business by a Government officer or employee in a travel status, the expenses incurred thereby can not be charged against the Government. (1 Dec. Compt. Gen. 299.)

Riparian Doctrine Definitely Discarded in Montana.

For the first time since the organization of Montana as a Territory, the common-law doctrine of riparian rights was asserted in court by Anna E. Mettler in the

case of *Mettler v. Ames Realty Co.* (201 Pac. 702.) The supreme court of the State held that the common-law doctrine of riparian rights has not prevailed in Montana since the enactment of the Bannack statutes in 1865, and that priority of appropriation confers superiority of right in all cases.

Riparian Rights in South Dakota.

One claiming the right in South Dakota to the use of water for irrigation purposes as a riparian owner is required to prove settlement upon the land in question by patentees prior to the enactment of the desert land act of March 3, 1877 (19 Stat. 377), which severed from public lands not previously entered upon all rights to the use of waters adjacent thereto, except for domestic purposes, and dedicated the remaining waters to the public. (*Haaser v. Englebrecht*, 186 N. W. 572.)

Appropriations in South Dakota Prior to 1881.

Persons who entered upon public lands in South Dakota subsequent to the enactment of the desert land act of March 3, 1877 (19 Stat. 377), and prior to the enactment of chapter 142, Dakota Laws, 1881, could acquire the right to the use of water by appropriation without notice, but an appropriation so made is subject to the same limitations and restrictions as appropriations made under said chapter 142. (*Cook v. Evans*, 186 N. W. 571; 185 N. W. 262.)

Title to Lands Bordering Lake in California.

Government patents to uplands bordering on a lake convey title to the actual margin of the lake, though the surveyed meandered line does not coincide therewith, in view of Civ. Code, section 830, so that a State patent, purporting to convey shore lands between the meandered line and the margin of the lake under the act March 24, 1893 (St. 1893, p. 341), gave no title where there had been no recession or drainage of the water of the lake. (*Craig v. White*, 202 Pac. 648.)

Use of Sewage Water in Colorado.

Waters of the public streams of the State of Colorado belong to the people, and appropriators acquire only a right to use and are limited in their use to their actual needs. Water taken by a city from a stream for use in sewers is not consumed by such use, and when it is purified the city has no title and can not sell it to an irrigating company to the detriment of lower appropriators. (*Pulaski Irr. Ditch Co. v. City of Trinidad*, 203 Pac. 681.)

Use of Percolating Water in Utah.

The owner of land is entitled only to a reasonable use of the percolating waters under his land for purposes connected with the beneficial ownership or enjoyment of his own land; and, for the use of such water by an owner to be a "reasonable use," especially in an artesian district, it should be limited first to his just proportion according to his surface area, and, second, he should not be entitled even to this quantity to the injury of others similarly situated, unless it is reasonably necessary for the beneficial purposes to which he devotes the water; and the owner has no right to injure his neighbors by an unreasonable diversion of the water for the purpose of sale or carriage to distant lands. (*Horne v. Utah Oil Refining Co.*, 202 Pac. 815.)

Damages from Oil Mixing With Irrigation Water.

In actions for damages to pasture lands caused by oil escaping into a stream and being carried over the lands upon the overflow of the stream, whether the measure of damages is to be based upon the usable value of the land as measured by loss of profits or upon the rental value of the land, must be determined by the circumstances of each individual case. A decree in such a suit may provide that if the party against whom damage is found shall pay that damage an injunction will not issue, but if such party neglects or fails to pay the damage assessed an injunction should issue. (*Sussex Land & Live Stock Co. v. Midwest Refining Co.*, 276 Fed. 932.)

Rights of Entry Under the Reclamation Law.

In *United States ex rel. Harden v. Fall*, Secretary of the Interior (276 Fed. 622), the Circuit Court of Appeals of the District of Columbia holds with the appellant Harden that the right, given by section 10 of the act of August 13, 1914 (38 Stat. 686), to enter lands withdrawn for irrigation purposes under the reclamation law if the lands were acquired by a prior entry since relinquished is not limited to those in privity with the original entryman through purchase of the relinquishment or otherwise. The appellant Harden was denied relief, however, on the ground that his entry was initiated at a time when the land was withdrawn under the first form and it was therefore void and could not be made valid by a subsequent order of the Secretary of the Interior declaring the land was not needed for construction purposes.

Mrs. G. B. Mathiot Admitted to Bar.

On February 13, 1922, Mrs. Gertrude B. Mathiot, of the Washington office, was admitted to the practice of law in the Supreme Court of the District of Columbia.

Bills Relating to Federal Reclamation.

IN THE HOUSE.

H. J. Res. 253.—"Joint resolution extending the time for the performance of certain acts under the act of Congress approved February 25, 1921, entitled 'An act to promote the mining of coal, phosphate, oil, oil shale, gas, and sodium on the public domain,' and for other purposes," introduced January 9, 1922, by Representative S. S. Arentz, of Nevada.

H. R. 9808.—"A bill to provide adjusted compensation for veterans of the World War and to provide for payment thereof," introduced January 10, 1922, by Representative Isaac Bacharach, of New Jersey.

H. R. 9816.—"A bill to provide for the discontinuance of certain Government publications and to establish branches of the Government Printing Office," introduced January 10, 1922, by Representative Edgar R. Kiess, of Pennsylvania.

H. R. 9909.—"A bill to encourage the development of agricultural resources, water power, and waterways of the United States through cooperation of the United States with the several States of the United States, in conjunction with each other, giving preference in the matter of employment and the establishment of rural homes to those who have served with the military and naval forces, and for other purposes," introduced January 13, 1922, by Representative John W. Summers, of Washington.

H. R. 9976.—"A bill authorizing the Secretary of the Interior to enter into an agreement with the Cut Bank Irrigation District, of Cut Bank, Mont., for the disposal of the surplus waters of Cut Bank and Badger Creeks, on the Blackfeet Indian Reservation, not needed by the Indians of the Blackfeet Reservation for domestic and irrigation purposes," introduced January 18, 1922, by Representative Carl Riddick, of Montana.

H. R. 10041.—"A bill for the relief of certain service men," introduced January 20, 1922, by Representative F. W. Mondell, of Wyoming.

H. R. 10211.—"A bill authorizing an appropriation to meet proportionate expenses of providing a drainage system for the Piute Indian lands in the State of Nevada within the Newlands reclamation project of the Reclamation Service," introduced January 31, 1922, by Representative S. S. Arentz, of Nevada.

H. R. 10248.—"A bill to amend the act of April 16, 1906, and the act of February 24, 1911, relative to the lease of surplus electric power on Federal irrigation projects," introduced February 2, 1922, by Representative Carl Hayden, of Arizona.

H. R. 10329.—"A bill making appropriations for the Department of the Interior for the fiscal year ending June 30, 1923, and for other purposes," introduced February 8, 1922, by Representative Louis C. Cramton, of Michigan.

H. R. 10614.—"A bill to encourage the development of the agricultural resources of the United States through Federal and State cooperation, giving preference in the matter of employment and the establishment of rural homes to those who have served with the military and naval forces of the United States," introduced February 27, 1922, by Representative Addison T. Smith, of Idaho.

H. R. 10769.—"A bill to provide adjusted compensation for veterans of the World War, and for other purposes," introduced March 7, 1922, by Representative Joseph W. Fordney, of Michigan.

IN THE SENATE.

S. J. Res. 158.—"Joint resolution to authorize the Secretary of the Interior, in his discretion, to furnish water to applicants and entrymen in arrears for more than one calendar year of payment for maintenance or construction charges, notwithstanding the provisions of section 6 of the act of August 13, 1914," introduced January 25, 1922, by Senator Miles Poin-dexter, of Washington.

S. 3045.—"A bill for the relief of William B. Lancaster," introduced January 20, 1922, by Senator Reed Smoot, of Utah.

S. 3077.—"A bill to amend an act entitled 'An act to provide capital for agricultural development, to create a standard form of investment based upon farm mortgages, to equalize rates of interest upon farm loans, to furnish a market for United States bonds, to create Government depositories and financial agents for the United States, and for other purposes,' approved July 17, 1916, known as the Federal farm loan act; and providing for loans in irrigation projects by Federal land banks," introduced January 27, 1922, by Senator Key Pittman, of Nevada.

S. 3117.—"A bill to amend the act of April 16, 1906, and the act of February 24, 1911, relative to the lease of surplus electric power on Federal irrigation projects," introduced February 6, 1922, by Senator Henry F. Ashurst, of Arizona.

S. 3140.—"A bill to authorize the Secretary of the Interior in his discretion to extend the time for payment of construction charges under Federal irrigation projects, and for other purposes," introduced February 11, 1922, by Senator Charles L. McNary, of Oregon.

S. 3196.—"A bill to encourage the development of the agricultural resources of the United States through Federal and State cooperation, giving preference in the matter of employment and the establishment of rural homes to those who have served with the military and naval forces of the United States," introduced February 24, 1922, by Senator Charles L. McNary, of Oregon.

S. 3254.—"A bill to encourage the development of the agricultural resources of the United States through Federal and State cooperation, giving preference in the matter of employment and the establishment of rural homes to those who have served with the military and naval forces of the United States," introduced March 8, 1922, by Senator Charles L. McNary, of Oregon.

—Ottamar Hamele.

Daylight Saving at Boulder Canyon.

In order to carry on the work of making borings at the Boulder Canyon dam site with economy and safety, the time of the camp has been advanced one and one-half hours in order that daylight can be used to advantage in prosecuting this hazardous work in the canyon which has a depth of approximately 2,000 feet at this point.

The volume of water in the river at this point is subject to considerable fluctuation, especially as the spring freshets are due in a few weeks, and arrangements have been made for telegraphing advance notice of the rise in water from Grand Canyon Park about 200 miles farther up the river.

WILLIS J. EGLESTON, 1872-1922.

NEWS of the sudden death at Butte, Mont., on March 9, 1922, of District Counsel Willis J. Egleston came as a distinct shock to his many friends throughout the Reclamation Service. Stricken suddenly in Denver on February 25, with what at that time was believed to be influenza, Mr. Egleston appeared to rally after a week's rest and was returning to his home in Helena, Mont., when symptoms of appendicitis developed and he was removed from the train to a hospital in Butte, Mont., where an immediate operation was performed, but death occurred five days later.

Mr. Egleston was born in Fillmore County, Minn., May 30, 1872. He attended both the University of Wisconsin and the University of Minnesota and was graduated from the law department of the latter institution. After being admitted to the bar of Minnesota in 1896 he practiced law in Minneapolis and later entered the Government service under the Census Bureau. In 1906 he secured a transfer to the legal division of the Reclamation Service. At the time of his death Mr. Egleston was located at Helena, Mont., and was the legal adviser for the Blackfeet, Flathead, Fort Peck, Huntley, Milk River, St. Mary Storage, Sun River, North Dakota Pumping, Lower Yellowstone, and Shoshone Federal irrigation projects.

Both by training and temperament the deceased was well equipped for his work. He had a keen legal mind coupled with the qualities that make a good judge. Imbued with the spirit of a lofty patriotism, he gave without stint to the service of the Government. Always a gentleman in the highest sense, he lent dignity and honor to every occasion he graced. His untimely death is a great loss to the Reclamation Service.

Mr. Egleston leaves a widow and four children, his mother, two brothers, and one sister, all of whom have in their bereavement the deepest sympathy of the entire Service.

On March 1, 1922, the Orland Unit Water Users' Association remitted to the local fiscal agent the amount of \$38,335.64, discharging in full the minimum operation and maintenance charge for the season of 1921.

The Arrowrock Reservoir is the largest, most important, and most expensive in the State of Idaho. It represents an investment of Government funds of over \$4,500,000 and is the principal source of agricultural prosperity of the most densely populated community in Idaho, comprising about 60,000 people and 250,000 acres of highly productive farms.

ADMINISTRATIVE AND STATISTICAL PROGRESS REPORTS FOR FEBRUARY, 1922.

Monthly conditions of principal Reclamation Service reservoirs for February, 1922.

[Elevation above sea level.]

State and project.	Reservoir.	Available capacity in acre-feet.	Elevation.		Storage in acre-feet.			Out-flow in acre-feet.	Elevation of water surface.		
			Spill-way crest. ¹	Lowest gate sill. ²	Beginning of month.	End of month.	Maximum.		Beginning of month.	End of month.	Maximum.
Arizona, Salt River.....	Roosevelt ³	1,305,000	2103	1903	692,066	799,109	799,109	.....	2080.49	2089.06	2089.06
California, Orland.....	East Park.....	51,000	1199.68	1111.68	17,230	40,010	40,010	.....	1174.68	1193.27	1193.27
Idaho:											
Boise.....	Arrowrock.....	280,000	3211	2956	103,500	120,000	124,000	30,000	3134.7	3144.2	3146.3
	Deer Flat.....	177,000	2518	2488	85,260	95,800	95,800	.....	2506.9	2508.3	2508.3
Minidoka.....	Lake Wolcott.....	95,180	4245	4236	82,640	82,410	83,200	320,505	4243.92	4243.9	4243.97
	Jackson Lake.....	847,000	6769	6730	288,270	314,240	314,240	.....	6745.18	6746.40	6746.40
Montana:											
Milk River.....	Nelson.....	27,000	2214	2200	19,000	17,800	19,000	.....	2209.5	2209	2209.5
St. Mary storage.....	Sherburne.....	66,000	4788	4720	.....	.....	.....	.....	.....	.....	.....
Sun River.....	Willow Creek.....	16,700	4130	4085	8,303	8,378	8,378	.....	4120.2	4120.3	4120.3
Nebraska-Wyoming, North Platte.....	Pathfinder.....	1,070,000	5852	5670	604,950	609,940	609,940	2,079	5826.04	5826.4	5826.4
	Lake Alice.....	11,400	4182	4159	5,120	4,528	5,120	.....	4172.5	4171.4	4172.5
	Lake Minatare.....	60,766	4125	4074	52,604	51,797	52,604	.....	4121.1	4120.7	4121.1
Nevada, Newlands.....	Lake Tahoe.....	120,000	6230	6224	.....	.....	.....	15,408	6224.74	6225.25	6225.26
	Lahontan.....	290,000	4162	4060	191,720	199,850	199,850	7,700	4152.4	4153.3	4153.3
New Mexico:											
Carlsbad.....	McMillan.....	45,000	3267.7	3241.6	32,500	33,250	33,250	.....	3265.5	3265.6	3265.6
Rio Grande.....	Elephant Butte.....	2,638,860	4407	4231.5	1,842,215	1,810,673	1,842,214	59,505	4384.7	4383.7	4384.7
Oregon, Umatilla.....	Cold Springs.....	50,000	621.5	560	13,475	27,600	27,600	.....	589.58	604.44	604.44
Oregon-California, Klamath.....	Clear Lake.....	462,000	4540	4514	333,500	336,000	336,000	.....	4035	4035.13	4035.13
South Dakota, Belle Fourche.....	Belle Fourche.....	203,000	2975	2920	101,600	110,750	110,750	.....	2960	2961.5	2961.5
Utah, Strawberry Valley.....	Strawberry.....	250,000	7558	7517	218,300	219,800	219,800	.....	7553.6	7553.8	7553.8
Washington:											
Okanogan.....	Conconully.....	14,400	2290	2232	2,434	2,600	2,600	.....	2256.7	2257.4	2257.4
Yakima.....	Bumping Lake.....	34,000	3426	3389	9,490	3,060	9,490	6,430	3402.9	3393.8	3402.9
	Lake Cle Elum.....	22,800	2134	2122	14,900	21,010	21,010	.....	2129.8	2132.6	2132.6
	Lake Kachess.....	210,000	2258	2192	178,795	183,410	183,410	.....	2248.2	2249.3	2249.3
	Lake Keechelus.....	152,000	2515	2425	106,320	110,990	110,990	.....	2495	2497.2	2497.2
Wyoming, Shoshone.....	Shoshone.....	456,600	5360	5132.3	399,760	399,151	399,760	13,532	5351.1	5351	5351.1

¹ Or maximum storage.² Or zero storage.³ Zero water depth at elevation 1902.2.⁴ Amount of silt shown by silt survey deducted from original capacity.⁵ Proposed regulation.⁶ Estimated low-water limit under proposed plan of regulation.⁷ Elevation of reservoir raised 12 inches by stop logs in spillway.

SALT RIVER PROJECT, ARIZONA.

Operation and maintenance of irrigation system.—The delivery of free flood water to the farmers was discontinued February 19. This caused an increased demand for irrigation water service during the first half of the month.

Two regular crews were in the field during the month and with a daily average of 77 man-days and 8 stock-days the following maintenance work was accomplished: Miles main canal cleaned, 11½; miles laterals cleaned, 84½; old structures repaired, 63; linear feet riprapping (stake and brush bank) built, 1,163; cubic yards dry masonry placed, 68; cubic yards concrete placed (repairs), 1½; dirt fill placed, 410.

In addition to the above maintenance work, the Ruth dredger, with a daily average of 4 man-days and 5 stock-days, bermed 68,070 linear feet of the Eastern Canal bank.

The P. & H. drag line, with a daily average of 1.6 man-days, bermed 7,760 linear feet of the Arizona Canal bank.

The following construction work was accomplished during the month with a daily average of 33 man-days and 16 stock-days: Cubic yards concrete placed, 33½; linear feet concrete pipe installed, 276; linear feet corrugated iron pipe installed, 207; miles irrigation

ditch completed, ½; miles well ditch completed, 3; miles well ditch 40 per cent completed, ½; miles waste ditch completed, ½; sill and stringer bridges built, 18; well sites fenced, 4; concrete headwalls built, 6; concrete spillway constructed, 1; cubic yards earth excavated, 45.

Construction of new pump houses was continued during the month and with a daily average of 6 man-days, the following results were obtained: Pump house constructed in January, painted, 1; pump houses completed, including painting, 4; linear feet 18-inch concrete pipe installed, 72; cubic yards concrete installed, 10; zanjero house moved, concrete foundation, porch and garage built for same, 1; roof repaired (general office building), 1.

Work was continued on widening the Eastern Canal. The Monihan 2-yard drag line and the Lidgerwood 1½-yard drag line excavated 13,253 cubic yards of boulders and loose rock.

In connection with the work of widening the Eastern Canal, caliche was encountered during the latter part of January, making it necessary to put on a blasting crew having a daily average of 21½ man-days and 2 stock-days. This crew accomplished the following results: Drilled 2,207½ feet holes; sprung 1,092 feet holes; shot 1,112 feet holes.

Operation of power system.—The total power generated during the month was 3,983,300 kilowatt-hours.

The Roosevelt power plant operated continuously during the month, generating 1,067,000 kilowatt-hours. The Cross Cut plant operated continuously with a total output of 1,961,800 kilowatt-hours. The South Consolidated plant operated 98.8 per cent, generating 482,700 kilowatt-hours. The Arizona Falls plant operated 60.7 per cent of the time, generating 169,750 kilowatt-hours; and the Chandler plant operated 98.4 per cent, with a total output of 302,050 kilowatt-hours.

The substations all operated without trouble and the pumping plants were all available for service as required.

Construction work; new drainage pumps.—To date the drilling of 18 new drainage wells west of Phoenix has been completed and the drilling of 2 others is under way; 4 wells were completed during February.

Power lines for new pumping plants.—The digging of holes and raising of poles was completed during the first part of the month.

Marinette substation.—Work was started installing the 1,500-k. v. a., 11,000-volt bank of transformers, and rewiring the station.—*C. C. Cragin.*

YUMA PROJECT, ARIZONA-CALIFORNIA.

February weather was colder than normal: No damage was caused to crops. Crop prospects are good, with the possibilities of a considerable increase in the acreage of short-staple cotton. Public notice for 1922 was approved February 25, 1922, fixing the minimum rate at \$4 for 2½ acre-feet, with \$1 for excess water, and providing for cheap water for reclaiming alkali lands.

On the South Drain the Bucyrus 30-B continued the recut work, advancing 2.85 miles, with an excavation of 12,000 cubic yards. It is expected that this work will be completed by the 1st of April, when the machine will commence cleaning the lower end of the Main Drain. On the East Central Drain the type 14 Bucyrus completed 1,400 linear feet, which finished this drain; the excavation was 9,500 cubic yards. The machine then cleaned the East Drain as far west as the Central Main Canal, and at the end of the month was crossing the canal preparatory to work on the North Drain.

On the Valley Division, Ruth dredges Nos 7, 8, and 9 cleaned 11 miles of laterals, excavating 15,060 cubic yards of silt. Ruth No. 7 was overhauled and a new engine installed. On the Reservation Division, Ruth No. 6 cleaned 4 miles of lateral, excavating 5,894 cubic yards of silt.

The maximum discharge of the Colorado River was 17,600 second-feet, minimum 4,500 second-feet, total for the month 598,000 acre-feet. On February 28 the gauge was 17.85, with a discharge of 13,700 acre-feet.—*Porter J. Preston.*

MESA DIVISION, YUMA PROJECT.

Owing to the completion of the Central check and turnout, the supply canal turnout and the Patterson turnout, located along the project, East Main Canal, construction work on the Mesa Division was carried on with a force slightly reduced from the month previous.

At the lock-joint pipe manufacturing plant 8,928 linear feet of pipe were cast; sizes ranging from 15 to 36 inches in diameter. Rock was also quarried and crushed for concrete aggregate and a small yardage of "one-man" rock turned out for riprapping and paving at completed structures.

The laying of pipe-line laterals and construction of minor structures along the lateral system was carried on steadily, but under a temporary handicap occasioned by the removal of the class 206 drag-line excavator, which was moved into emergency service at a 90-foot break in the project East Main Canal.

At the B lift pumping plant all constructive effort was directed toward the completion of features embraced under this head. Electrical tests were also started on all electrical machinery and equipment, and the plant as a whole put in condition for the first pumping efficiency test.—*Porter J. Preston.*

ORLAND PROJECT, CALIFORNIA.

Precipitation amounting to 4.62 inches at Orland and 5.74 inches at East Park occurred during February, making the month very unfavorable for outside work. Aside from the precipitation, which was about 2 inches above the February mean, weather conditions were normal.

Storage at East Park amounted to 40,000 acre-feet at the close of the month and the flow of Stony Creek was such as definitely to assure storage to the full capacity of the reservoir. The Feed Canal was in operation throughout the entire month, delivering 6,800 acre-feet at East Park Reservoir while 15,400 acre-feet of storage were derived from the run-off of Little Stony Creek.

Placing of concrete lining was continued as weather conditions permitted. There were 9,863 square yards of lining placed on 1.3 miles of laterals. There were only 12 days on which the maintenance force was able to work. Two and one-half miles of laterals were cleaned by teams and 2 miles of concrete-lined sections were cleaned and repaired by hand.

There was little activity in farm development owing to the protracted rains. The annual election of the Orland Unit Water Users' Association, held on February 25, resulted in the reelection of five members of the previous year's board of directors and the election of two new members.—*R. C. E. Weber.*

GRAND VALLEY PROJECT, COLORADO.

February weather was cool and cloudy, with considerable rain and snow, which interfered with outside work.

On account of frost in the ground, little plowing or other spring farm work was started. Crop prices showed a slight improvement during the month, except alfalfa, which remained at about \$7 per ton. The hay in the east end of the project was nearly all marketed, but there was still a considerable tonnage on hand in the west end. A second payment was made on last year's beet crop, bringing the total to date up to \$5.75 per ton. New contracts were being offered the growers on about the same basis as last year, with a minimum of \$4.50 per ton.

Maintenance work was limited to miscellaneous structure repairs, except for one small team outfit, which started on lateral cleaning at the end of the month. The machinery at the Price-Stub pumping plant was overhauled, reassembled, and put in first-class shape for operation. Drainage construction was continued with the P. & H. drag line working one shift per day on drain E-1, and this drain was completed on the 24th.

The contract between the United States, the Orchard Mesa Irrigation District, and the Grand Valley Water Users' Association was executed by the two latter parties and transmitted to the Denver office.—*S. O. Harper.*

UNCOMPAHGRE PROJECT, COLORADO.

February weather was favorable for both construction and operation and maintenance work, except for one cold spell during the fore part of the month. The total snowfall amounted to 1½ inches.

There was considerable demand for water in the project canals and laterals for stock and domestic purposes. There was also a small demand for irrigation water, in order to take care of the onion crop, some of which was planted during the early part of the month.

The P. & H. drag line completed the back filling of the flood channel made by the Uncompahgre River in June, 1921, back of the rock basket wall at the Selig headworks, and was then moved into the Selig Canal for gravel-cleaning purposes. All of the repair work necessary to put the Montrose & Delta Canal headworks in condition for safe operation during the coming irrigation season was completed, and similar work was begun at the Selig Canal headworks, the driving of the protective piling below the weir being completed.

Considerable riprap work on canals and laterals and along the Uncompahgre River near the location of project structures was accomplished at various times by ditch-rider crews.—*L. J. Foster.*

BOISE PROJECT, IDAHO.

Winter weather extended through the entire month of February; at the end of the month there was still considerable frost in the ground.

The number of unemployed remained the same as in the previous month. Winter weather conditions prevented the beginning of outside work. As soon as the frost leaves the ground it is thought that there will be sufficient work to take care of the local unemployed.

Work on the farms was confined principally to the care of live stock and pruning in the orchards. The hay market still remains stagnant; a small amount was sold to feeders to finish out the season. There was a decided advance in the price of wheat, and the small amount that remained in the hands of the farmers was hauled to the elevators.

The run-off from Boise River was about 71 per cent of normal. The combined storage in Arrowrock and Deer Flat reservoirs was slightly less than a year ago at this time, but was about normal for the season. A large amount of new snow fell in the mountains during the month and little of it melted. The indications were that the water supply for the coming season would be good.

Water was turned into the Main Canal on February 12 for filling Deer Flat Reservoir. The head was gradually increased until the canal was carrying 1,000 second-feet by the end of the month. Considerable trouble was experienced by ice lodging against the checks and piling up in Indian Creek Channel. Minor repairs were begun on structures the latter part of the month. The force employed was small.

Test borings were continued at Black Canyon diversion site.—*J. B. Bond.*

Crop report, Uncompahgre project, Colorado, 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	24,015	Ton.....	62,520	2.6	\$5.31	\$332,335	\$13.76
Alfalfa seed.....	280	Bushel.....	548	2.0	5.95	3,259	11.33
Apples.....	1,871	Pound.....	9,150,000	4,891.0	.027	245,660	131.31
Barley.....	107	Bushel.....	2,543	23.8	.48	1,213	11.52
Beans.....	188	do.....	2,315	12.3	3.44	8,746	46.52
Beets (sugar).....	1,533	Ton.....	15,885	10.3	5.66	89,922	58.65
Clover hay.....	126	do.....	159	1.3	5.05	804	6.38
Clover seed.....	181	Bushel.....	531	2.9	5.67	3,013	16.64
Corn (Indian).....	1,848	do.....	60,637	32.8	.57	34,528	18.68
Corn fodder.....	176	Ton.....	1,683	9.6	1.08	1,821	10.35
Ensilage.....	351	do.....	3,423	9.5	5.23	17,903	51.00
Fruits, small.....	49	Pound.....	133,980	2,734.3	.0794	10,638	217.10
Garden.....	411	do.....	517	1.5	4.79	43,658	106.22
Hay.....	343	Ton.....	517	1.5	4.79	2,476	7.22
Oats.....	6,445	Bushel.....	185,840	28.8	.35	65,368	10.14
Onions.....	365	do.....	150,468	412.3	1.42	213,945	586.18
Pasture.....	8,019	do.....	133,300	1,360.2	.0518	6,902	347.00
Peaches.....	98	Pound.....	7,650	2,550.0	.0274	210	70.42
Pears.....	3	do.....	6,300	2,100	.0744	469	70.00
Prunes.....	3	do.....	1,859,572	172.1	.67	1,252,310	155.83
Potatoes, white.....	10,806	Bushel.....	235	16.8	.60	141	10.07
Rye.....	14	do.....	354,273	23.7	.68	241,536	19.63
Wheat.....	12,307	do.....				9,579	79.16
Miscellaneous.....	121						
Less duplicated areas.....	6,060						
Total cropped.....	63,600					2,614,300	41.10
Nonbearing orchard.....	17						
Young alfalfa.....	3,177						
Ground fall plowed.....	4,670						
Miscellaneous.....	400						
Less duplicated areas.....	8,104						
Total irrigated.....	63,760						
		Areas.	Acres.	Farms.	Per cent of project.		
		Total irrigable area farms reported.....	84,919	1,639	85		
		Total irrigated area farms reported, under rental contracts.....	63,760	1,639	64		
		Total cropped area farms reported.....	63,600	1,639	64		

KING HILL PROJECT, IDAHO.

February weather was unfavorable for outside work. Roads were extremely bad and hauling difficult.

Construction work was confined to the manufacture and laying of lock-joint pipe siphons, with the exception of a small amount of excavation at the crooked flume, which work was discontinued on account of frost almost immediately after starting operations.

Two hundred and forty linear feet of 54-inch lock-joint pipe were placed and back filled at Slick Siphon No. 1; 174 linear feet of 54-inch lock-joint pipe placed and back filled in Slick Siphon No. 2; 159 feet of 48-inch pipe were hauled to Little Alkali Siphon; teams excavated 110 yards of material at Hammett Siphon, at which structure 168 linear feet of 24-inch pipe were hauled to site and 80 linear feet of pipe laid. At King Hill Siphon teams excavated 372 cubic yards of material; 2,052 linear feet of 21-inch and 27-inch pipe were hauled to place and 1,212 linear feet of pipe laid. The P. & H. 206 drag line was used in placing the 48-inch and 54-inch pipe; the smaller lines were laid by hand.

King Hill pipe plant completed the lock-joint pipe proposed for this season's use, having manufactured 8,327 linear feet of pipe of sizes varying from 21 to 54 inches, at an average cost of \$3.58 per linear foot.

Cattle and sheep brought from the range for feeding were in good condition. Stockmen were able to obtain alfalfa hay for \$4 to \$5 a ton.—*Walter Ward.*

MINIDOKA PROJECT, IDAHO.

Unusually cold weather continued during the greater part of February. Precipitation amounted to 1.26 inches, most of which was in the form of snow. This amounted to 14½ inches.

A good deal of attention was given to working up and investigating the financial statements that had been received from water users. Collections during the month were very satisfactory.

Work of overhauling the pumping stations in preparation for the season's work was practically completed.

At American Falls four parties were engaged in surveys of the right of way for the reservoir. A little more than 28 miles of traverse were run and 16 sections of land were subdivided. It is estimated that 58 per cent of this work has been done. Computations in connection with sewer and water systems and with street grading for the new town site were carried on.

A meeting was held in Pocatello on February 10 under the auspices of the Idaho Reclamation Association, which was attended by representatives of the canal companies and irrigation districts that had

Crop report, Boise project, Idaho, 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	43,061	Ton.....	196,358	4.56	\$4.00	\$785,432	\$18.24
Alfalfa seed.....	1,070	Bushel.....	4,280	4	7.20	30,816	28.80
Apples.....	1,371	Pound.....	13,710,000	10,000	.0237	324,927	237.00
Barley.....	3,200	Bushel.....	89,600	28	.45	40,320	12.60
Beans.....	50	do.....	575	11.50	3.60	2,070	41.40
Clover hay.....	7,900	Ton.....	12,245	1.55	4.00	48,980	6.20
Clover seed.....	5,870	Bushel.....	35,220	6	7.80	274,716	46.80
Indian corn.....	4,985	do.....	224,325	45	.50	112,164	22.50
Corn sorghum.....	58	Gallon.....	5,394	93	.75	4,045	69.75
Corn fodder.....	395	Ton.....	3,950	10	4.00	15,800	40.00
Small fruits.....	158	Pound.....	790,000	5,000	.07	55,300	350.00
Garden.....	590	do.....	118,000	200	.....	118,000	200.00
Hay.....	54	Ton.....	124	2.30	4.00	496	9.20
Millet seed.....	11	Bushel.....	264	24	.80	211	19.20
Oats.....	2,465	do.....	86,275	35	.35	30,198	12.25
Onions.....	38	do.....	3,040	80	1.50	4,560	120.00
Pasture.....	5,880	do.....	117,600	20	.....	117,600	20.00
Peaches.....	105	Pound.....	840,000	8,000	.04	33,600	320.00
Pears.....	26	do.....	182,000	7,000	.04	7,280	280.00
Prunes.....	600	do.....	3,000,000	5,000	.018	54,000	90.00
Potatoes, white.....	5,200	Bushel.....	1,352,000	260	1.00	1,352,000	260.00
Potatoes, sweet.....	20	do.....	4,300	215	2.00	8,600	430.00
Rye.....	180	do.....	2,520	14	.45	1,134	6.30
Wheat.....	26,980	do.....	917,320	34	.75	687,990	25.50
Pop corn.....	96	do.....	4,992	52	3.00	14,976	156.00
Sweet corn.....	22	do.....	770	35	2.50	1,925	87.50
Lettuce.....	300	Crate.....	48,000	160	1.25	60,000	200.00
Mellons.....	70	Pound.....	1,120,000	16,000	.015	16,800	240.00
Less duplicated areas.....	7,415						
Total cropped.....	103,340	Total and average.....				4,203,940	40.68
Nonbearing orchard.....	35						
Young alfalfa.....	6,700						
Young clover.....	780						
Miscellaneous.....	645						
Other purposes.....	8,160						
Total irrigated.....	111,500						
		Areas.	Acres.		Farms.	Per cent of project.	
		Total irrigable area farms reported (145,069).	120,200		2,686	1.83	
		Total irrigated area farms reported.....	111,500		2,686	76.9	
		Under water right applications.....	105,029		.....	72.5	
		Under rental contracts.....	6,471		.....	4.4	
		Total cropped area farms reported.....	103,340		2,686	71.2	

¹ The Nampa-Meridian Irrigation District makes delivery to 24,105 acres or 16½ per cent of total irrigable area. Crops on this area are not included in this report.

contracted for storage water in American Falls Reservoir. It was pointed out that as these contractors had not met the payments due the United States on their contracts, the work at American Falls could not proceed. As it did not seem practicable to raise the necessary funds by direct assessment at this time, it was decided to form a large reservoir district which would issue bonds for carrying on the work.—*Barry Dibble.*

HUNTLEY PROJECT, MONTANA.

February weather was exceedingly cold. The precipitation for the month was far below normal, although 6 to 9 inches of snow remained on the ground for the entire month.

Climatic conditions prevented any extended field work. Only two mechanics were employed in completing overhauling work in the auxiliary pumping plant and miscellaneous repairs to small equipment.

The continued cold weather induced heavy feeding of stock, resulting in the early depletion of the hay supply. Indications were that the stock loss would be quite heavy. Hay advanced to a very high price, the available surplus being quoted at \$15 to \$18 in the stack.—*A. R. McGinness.*

MILK RIVER PROJECT, MONTANA.

February weather was unusually severe. There was about 10 inches of snow on the ground at the end of the month, and reports indicated a considerable loss of range stock. The labor supply was ample, with no demand.

The contractor for the erection of buildings at Dodson Dam made fair progress considering the weather.

Inspection and repair of concrete siphons were continued on the Glasgow Division.—*George E. Stratton.*

ST. MARY STORAGE.

Cold winter weather prevailed during almost the entire month of February. The temperature averaged considerable below normal, and, while there were no extremely severe storms, there were no thaws of any consequence, and it was impossible to carry on any field work.

Office work was cut to a minimum. No field work was done except caring for stock at St. Mary River Crossing camp. The only field men employed were caretakers at Sherburne Lakes Dam and St. Mary River Crossing camps.—*R. M. Snell.*

SUN RIVER PROJECT, MONTANA.

With the exception of January, 1916, February, 1922, was the coldest month on record since the establishment of the Fort Shaw weather station in June, 1907.

A small force was engaged in overhauling equipment and caring for stock, the office force in writing the 1921 project history, and the engineering force on specifications, designs, and estimates for work on Part Two of Greenfields Division and on the project history.

It was necessary to continue feeding of stock, and a large proportion of the surplus hay on the project was thus consumed; outside feeders and farmers on the Greenfields Bench were steady purchasers of hay from the Fort Shaw Division. At the close of the month the hay market was strong, with prices somewhat advanced. Wheat advanced about 20 cents per bushel and flax about 40 cents. Except for baling and marketing of hay and caring for stock, no farm work was

done; roads on the greater part of the project were in bad shape, and the weather was too severe for outside work. Twenty-eight carloads of wheat, 34 of hay, and 2 of spuds were shipped from the project.—*Geo. O. Sanford.*

Prevailing crop prices at close of February, 1922.

Project.	Alfalfa hay, per ton.		Barley, per bushel.	Oats, per bushel.	Wheat, per bushel.	Potatoes, per bushel.
	In stack.	Baled at shipping point.				
Salt River.....	\$8-\$10	\$12-\$14	\$0.75	\$0.52	\$1.47	.....
Yuma.....	10.00	15.00				
Orland.....	12.00	15.00	.53		1.05	
Grand Valley.....	7.00	10.00		.45	.90	\$0.90
Uncompahgre.....	5-10		.63	.42	1.02	.60
Boise.....	4.00	8.00	.45	.42	.90	.70
King Hill.....	4-5					.90
Minidoka.....	3.00	6.00	.50	.33	1.05	
Huntley.....	15-18					
Milk River.....	6-8	10-11	.29	.41	1.27	.90
Sun River.....	6-7	9-10	.50	.45	1.26	.65
Lower Yellowstone.....	15.00	18.00	.45	.45	1.32	.80
North Platte.....	4.50		.35	.30	.80	.80
Newlands.....	6.00	10.00	.95	.75	1.20	1.00
Carlsbad.....		12-16		.70		
Rio Grande.....		15-20		.60		
North Dakota pumping.....						
Umatilla.....	7.00	11.00				
Klamath.....	4-6		.53	.37	1.05	
Belle Fourche.....	10.00	14.00	.48	.40	1.15	1.40
Strawberry Valley.....		11.00	.75	.50	1.10	
Okanogan.....	10.00					1.20
Yakima:						
Sunnyside.....	4-6	8-9.50				.70
Tieton.....	4-6	8-9.50				.70
Riverton.....	4.00		.60	.40	1.15	.75
Shoshone.....	5.00	8.00		.60	1.13	.76
Indian projects:						
Blackfoot.....	20.00		.62	.56	1.24	.....
Flathead.....	12.00	16.00		.47	1.21	.60
Fort Peck.....					1.27	1.25

LOWER YELLOWSTONE PROJECT, MONTANA-NORTH DAKOTA.

This was the coldest February on record, surpassing February, 1917, the previous record, by 1 degree.

During the month piling, turbines, pumps, reinforcing steel, and cement for the Thomas Point pumping plant were received and unloaded. Lumber to be used in connection with the contract under specifications 402 was received at Nohly, Dore, Ridgeland, and Savage.

The necessary field work was carried on in connection with land surveying, looking to the establishing of farm units for lands under extension.

During the month alfalfa increased in value over 100 per cent and wheat and flax about 10 per cent. Owing to the severe weather, range stock suffered for lack of feed, and reports were received that the loss will be the heaviest in many years.—*L. H. Mitchell.*

NORTH PLATTE PROJECT, NEBRASKA-WYOMING.

Storage Division.—Valve No. 1 in the south tunnel at Pathfinder continued open throughout the month to discharge 100 second-feet for water supply to the city of Casper and oil refineries in that vicinity.

Interstate Division.—Maintenance work was confined to the straightening of lower chord members on Main Canal bridges in the First Division. Other work

consisted of a general cleaning up around camps, placing them in condition for sale on April 1.

Fort Laramie Division.—As the flow in the North Platte River past the headworks remained steady throughout the month, little difficulty was experienced in operating the Fort Laramie Canal to the Lingle power plant. Maintenance forces on this division were engaged in the construction of an operation and maintenance road over Tunnel No. 1, which at the end of the month was 80 per cent complete.

Crops.—Live-stock shippers reported fair profits on cattle marketed during the month; sheep brought very high returns. Farmers in the vicinity of Mitchell were planning on feeding about 50 carloads of cattle on the surplus of wet beet pulp obtained at the Great Western Sugar Co.'s yard. It was understood that these cattle will be shipped on the June market. It was estimated that between 40 and 45 per cent of the grain raised on the project last year was still unmarketed.

Drainage, Interstate Division.—Drainage construction work on the Interstate Division was confined to the raising of one bridge over the Minature Drain and the hauling of all materials and supplies to Minature and Camp 12 for storage. All forces, with the exception of two chief operators, were laid off the middle of the month. These latter men are retained to overhaul and repair draglines Nos. 122229 and 122230.

Seepage areas are gradually draining out, although the process is very slow. The McAllister Drain became obstructed to flow during the month and the seepage discharge from the Dutch Flats shows that this area is not draining out as rapidly as was expected.

Fort Laramie Division.—Electric drag line No. 131313 continued work on the Katzer Drain between station 149 and station 150 and on branch A between station 0+00 and station 45. The machine completed 0.87 mile of drain during the month. Progress was retarded by frost and the adhesive character of the soil excavated.

Construction activities in the Cherry Creek area were confined to the construction of three farm bridges, which completes all the work contemplated on this system under the present estimate and authority. On the Katzer system equipment was assembled and installed for unwatering the French siphon site. Concrete pipe were also cast and placed.

Construction, Fort Laramie Division.—The three electric drag lines continued operations on the Fort Laramie Canal, completing 1.30 miles of canal during the month. On the 20th drag line No. 131345 commenced moving to Lyman, Nebr., from which place it will be shipped to the Shoshone project, Wyoming.

Cold weather confined construction activities on this division to the cutting of weir lumber, placing of weirs and turnout gates, and the completion of three farm bridges. At the end of the month the Second Lateral District was 85.5 per cent complete.

Northport Division.—Drag line No. 121471 completed the 32-foot cut between station 613 and station 647+50, Northport Canal. From there it moved to station 671. Over 55 per cent of the yardage excavated by this machine in the above cut was class 2 material.

Power system.—The Lingle power plant was operated continuously throughout the month and delivered 5,000 kilowatt hours to the town of Lingle, Wyo.; 27,800 kilowatt hours to Torrington, Wyo.; 9,000 kilowatt hours to Morrill, Nebr.; and 27,800 kilowatt hours to Mitchell, Nebr. The total output for the month was 211,900 kilowatt hours. Of this amount 20.6 per cent was lost in transmission.

Surveys.—Field work on the location and irrigable area surveys on the Table Mountain system was completed and the force was engaged in plotting field work and obtaining an estimate of quantities involved. The field party on the Northport Division had taken 5,500 acres of irrigable areas by the end of the month.—*E. E. MacDonald.*

Summary of employees for March, 1922.

Projects.	Beginning of month.	End of month.	Increase.	Decrease.
Washington office.....	82	82		
Denver office.....	73	71		2
Field legal.....	23	23		
Examiners of accounts.....	3	3		
Yuma.....	130	134	4	
Yuma Auxiliary.....	143	147	4	
Orland.....	70	62		8
Grand Valley.....	26	26		
Uncompahgre.....	55	73	17	
Boise.....	48	81	33	
King Hill.....	73	109	36	
Minidoka.....	80	78		2
Huntley.....	8	8		
Lower Yellowstone.....	17	16		1
Milk River.....	34	33		1
St. Mary Storage.....	10	10		
Sun River.....	23	23		
North Platte.....	233	222		11
Newlands.....	109	153	44	
Carlsbad.....	34	15		19
Rio Grande.....	509	422		87
North Dakota Pumping.....	22	21		1
Umatilla.....	25	25		
Klamath.....	28	34	6	
Belle Fourche.....	15	15		
Strawberry Valley.....	20	19		1
Okanogan.....	8	7		1
Yakima.....	73	118	45	
Tieton Dam.....	182	243	61	
Riverton.....	67	60		7
Shoshone.....	181	137		44
Flathead.....	34	34		
Fort Peck.....	7	5		2
Unassigned per diem.....	24	25	1	
Secondary.....	73	85	12	
Total employees.....	2,542	2,618		
Increase.....			263	
Decrease.....				187
Net increase.....			76	

NEWLANDS PROJECT, NEVADA.

February weather was unfavorable for construction and maintenance work. There was considerable precipitation. Snowfall at the Summit station in the high Sierras was 164 inches at the end of the month.

Frozen ground and snowfall made it impossible for many of the contractors to commence work on lateral cleaning work.

The temporary timbering of Truckee Canal tunnels progressed intermittently. Ice and water in the canal interfered with this work.

Bids were opened on February 18 for earthwork in the C' 1, N Wasteway, and AA Laterals as a portion of the program for the maintenance of the lateral system and for the new Hodgen Lateral and reconstruction of the C1A Lateral chargeable to construction.

Considering the very bad condition of the roads, which made hauling of supplies difficult, good progress was made on the construction of deep open drains. The two Bucyrus class 14 drag-line excavators on the New River, L, and Harmon Extension drains, and the Monighan 1 T machine on the Carson Lake Drain were in operation almost the entire month. Frozen ground made it necessary to shut down the P. & H. machine on the Lower Soda Lake Drain and the

Monighan machine on the Fernley Drain most of the month. The Monighan machine on the Kent Lake Drain was laid up for repairs.

The placing of a No. 60 Hess metal flume, 350 feet in length, in the Hodgen Lateral, V system, was practically completed.—*John F. Richardson.*

CARLSBAD PROJECT, NEW MEXICO.

February weather was fair and the temperature moderate until nearly the close of the month, when a high windstorm, accompanied by sleet, lowered the temperature to about 8 degrees. The total precipitation for the month amounted to 0.28 inch, which came in a snowstorm on the night of the 28th. The total discharge of the Pecos River at the Dayton station amounted to 12,450 acre-feet. This was a reduction of about 5,000 acre-feet below that of the previous month. This curtailment of discharge was due to water being used in the Hagerman Irrigation District near Roswell. McMillan Reservoir showed a decrease for the last 10 days in the month, and the storage was gradually receding, owing to leakage and reduced flow of the river.

Painting the Black River flume and minor repairs in the concrete section of the Black River Canal were completed. Practically all of the teamwork on maintenance was completed, and the force employed on general maintenance work was reduced to the minimum.

Activities on the farm were confined to preparing of land for the ensuing crop year. A few carloads of hay were shipped from the project. The cottonseed mill at Loving started to operate about the 20th and was well under way at the close of the month.—*L. B. Foster.*

RIO GRANDE PROJECT, NEW MEXICO-TEXAS.

The inflow into the Elephant Butte Reservoir during February was 38,132 acre-feet, which was determined by the rise in the reservoir plus evaporation. The total outflow was 59,505 acre-feet, making a decrease in the reservoir during the month of 36,904 acre-feet. Water for irrigation purposes was in all main canals by February 1. As the irrigation demand was light, the excess water was used for sluicing sand out of canals.

The work of sluicing canals was progressing with most satisfactory results. Sand was moving fairly out of all main canals, the best results being obtained in the Franklin Canal, from which 61,000 cubic yards were moved during February. This was due chiefly to the effects of the skimming weir at the head of the canal.

All canals were in good state of repair for the opening of the season, as all cleaning contracts were completed by February 1. Repairs were made on minor structures and canal banks raised.

Considerable land was being leveled and put in better condition than during former years. About 300 acres will be planted to cabbage during the coming season, and it was expected that a much larger acreage will be planted to cotton than was the case last year. A sugar-beet company was preparing to plant 200 acres to sugar beets to determine the adaptability of this climate to the growing of sugar beets.

Construction forces employed on canals and laterals were considerably reduced with the resumption of the irrigation season. A small crew was still engaged at Elephant Butte on back fill against the walls of the spillway channel.

In the Leasburg and Mesilla Divisions four drag-line excavators were employed on drainage construction, constructing 4.4 miles. The Ruth ditch-cleaning machine covered 2.7 miles of the Las Cruces Lateral. A P. & H. excavator was transferred from the Fort Peck project. A large number of minor structures were installed in the laterals, and the lower end of the Barrio Lateral was reconstructed by teams.

In the El Paso Division, two Government-operated drag-line excavators and one contract machine continued drainage construction, completing 1.25 miles of drain. A force account team crew was employed on the reconstruction of the Jornada Lateral and the P. & H. drag line on the Ysla Lateral. A large number of minor structures were installed in laterals and screw-lift gates were placed in the Franklin Canal checks. The enlargement of the Franklin Feeder Canal was completed.—*L. M. Lawson.*

NORTH DAKOTA PUMPING PROJECT.

With the exception of 1878, no other February has exceeded the past month for coldness, and but one in recent years—that of 1899—has been as cold. The past month has been notable for steady cold, rather than isolated days of unusual coldness. The precipitation for the month was 0.50 inch.

A live-stock sale was held during the month with indifferent success.

About 86,000 kilowatt hours of electrical energy were sold to the city of Williston. This represents a considerable falling off from the same month of last year, due partially to extremely bad weather conditions and partially to general economy practiced by all consumers.

Eight hundred and twenty-one tons of coal were mined.—*Wm. S. Arthur.*

UMATILLA PROJECT, OREGON.

Low means for temperature and precipitation were recorded during the month of February. The total precipitation for the month was 0.67 inch, the average for the previous 13 years being 1.03 inches.

Farm work was backward, the frozen condition of the ground preventing preparations for the irrigation season. Some pruning was done. Ninety cars of baled hay, three cars of alfalfa meal, and 9,490 pounds of honey were shipped during the month.

The feed canal was partially operated under difficulties. Owing to ice conditions, water was cut out of the canal on the 1st; on the 4th about 60 second-feet were diverted; but on the afternoon of the 6th all water was again cut out in preparation for a flood coming down Stage Gulch. Flood waters reached the canal about 7.30 p. m. At 10 p. m. 137 second-feet were running into the canal. Dams had been placed in the canal above and below the spillway, which diverted all the water to the Stanfield Drain. By the morning of the 7th the flood waters had gradually receded to about 42 second-feet. A Chinook wind again started flood conditions, which grew gradually worse on the 8th, reaching the peak flow about 7 p. m., when 750 second-feet were being diverted through the spillway. In addition, 300 second-feet were flowing into the canal above dam, making a total inflow to the canal of 1,050 second-feet. Owing to the canal being partially choked with ice, the water got over the lower bank in several places, but the frozen condition of the banks saved a serious break. From the night of the 8th to the night of the 9th the flood gradually decreased. On the morning of the

10th about 50 second-feet were diverted from the river to the feed canal to clear it of ice. Ice jams formed and a small crew was employed to break them, dynamite being used.

On the morning of the 16th water was again cut out of the canal in anticipation of flood conditions in Stage Gulch. On this occasion the maximum inflow to the canal was 115 second-feet, which was easily taken care of. On the 18th the canal was free of ice and 200 second-feet were diverted from the river, which was increased gradually to 276 second-feet. On the 24th a break occurred $1\frac{1}{2}$ miles west of Echo. This was caught in time. Water was diverted at the spillway and the break fixed. At the end of the month 284 second-feet were being diverted from the river for the reservoir.—*H. M. Schilling.*

KLAMATH PROJECT, OREGON-CALIFORNIA.

Throughout February the ground was covered with snow from 6 to 10 inches deep.

The Diversion Canal was operated during the entire month diverting water from Lost River to the Klamath River.

During the latter part of the month excavator No. 121248 was moved to the upper end of the C Canal and began the work of enlarging.

On February 3 bids were opened for constructing a reinforced-concrete culvert under the J Canal. Only two bids were received; the award was made to W. D. Miller, of Klamath Falls.

Final profiles were being prepared for the laterals in the Tule Lake Division. The farm-unit layout for the first part of the Tule Lake Division was completed. Plans were prepared for the farm turnouts from the J Canal, also for the flume for the J-1 Lateral across Lost River. The study on Tule Lake inflow and control was being continued.—*Herbert D. Newell.*

BELLE FOURCHE PROJECT, SOUTH DAKOTA.

February was altogether the coldest month of the year. It came in with a two-day blizzard which tied up railroad traffic for four days and blocked all country roads, so that it was very difficult to travel even with a strong team and light wagon. Cold weather continued throughout the month with very little cessation.

The only canal operated during the month was the Inlet or Feeder Canal, delivering water from the Belle Fourche River into the reservoir. This canal ran continuously during the month, carrying a total of 12,000 acre-feet. The canal was covered with between 2 and $2\frac{1}{2}$ feet of ice, and some trouble was experienced in the handling of gates. More trouble is anticipated in case of a rapid melting of the rather unusual amount of snow in the drainage area.

Owing to the continued cold weather, the price of hay throughout this section of the country increased materially within the last 30 days. In the Arpan District the price of hay increased from \$3 to \$6; and in the Vale District, where some slightly damaged hay sold in December for as low as \$2 in the stack, it was selling at as high as \$12 in small quantities. Near Newell the price increased from \$6 in the stack to about \$9 or \$10. There was a considerable supply of hay in certain sections of the project; but, considered as a whole, there will probably be very little if any hay left when the spring season opens.

Stock on the project was generally in very good condition, for the reason that hay has been plentiful and until recently quite cheap. Outside stock was reported

to be in bad condition, with many thousands of sheep already destroyed. This loss was occasioned by the crusting over of the deep snow which covered the entire grazing district in the northwestern part of the State. The market price of sheep and hogs increased during the past month or six weeks until the price was quite satisfactory. Cattle did not show so much improvement, but stockmen were confidently expecting an increase in the price of cattle within a reasonable time. The better demand for fat hogs and sheep braced up the spirits of the farmers, so that they were looking ahead with more confidence in the future than they had shown for several months past. It seemed to be the general opinion of everyone that the bottom of the depression was in the past and that better times might be looked for within the next year.—*B. E. Hayden.*

STRAWBERRY VALLEY PROJECT, UTAH.

February weather was unusually stormy and cold, with abnormal precipitation. The depth of snow on the watershed around the reservoir was between 50 and 60 inches, insuring at least an average run-off during the spring. This means that Strawberry Reservoir will be filled to overflowing and surplus waters will be wasting over the spillway at Strawberry Dam early in May.

Owing to the extremely unfavorable weather conditions no farming operations of any kind were in progress during the month. The price of cereals and hay again took a slightly upward turn, but the demand was so slight that little movement of these commodities took place.

Abundance of all classes of labor existed throughout the month. Solicitations were being made by various charitable organizations to find work for the numerous unemployed.

The power plant was operated without interruption and power furnished to the towns of Spanish Fork, Payson, Springville, and Salem. The continued cold weather and heavy snows caused considerable trouble in the operation of the power canal. Two men were constantly employed in breaking ice jams and flushing snow from the canal. Plenty of water, however, was available in the Spanish Fork River for power purposes, so that power service was unimpaired.

Few collections of operation and maintenance or construction charges were made during the month, but improvement was expected as soon as the farmers can dispose of their surplus stocks of hay and grain.

A tentative form of contract between the United States and the Strawberry Water Users' Association for taking over the operation and maintenance of the project by the association was drafted and submitted to the chief engineer for consideration.—*W. L. Whittemore.*

OKANOGAN PROJECT, WASHINGTON.

February weather remained very cold throughout the entire month, but with a fair amount of precipitation. At the close of the month there did not appear to be enough snow in the watershed to produce the amount of water necessary for the project. The ground, however, appeared to be frozen under the snow to some depth, and this condition may cause a larger run-off than might otherwise be anticipated.

The master mechanic and one helper were busy throughout the month in finishing repairs to project trucks and automobiles and in the installing of some machinery which was brought here from the Salmon

Lake Dam work. The office force was employed throughout the month on routine office work and in working up data and writing a portion of the annual project history and operation and maintenance report.—*Calvin Casteel*.

YAKIMA PROJECT, WASHINGTON.

February temperature was below normal, the mean being the lowest of record for the past 11 years. Snowfall during the month and depth of snow on ground at end of month at the storage reservoirs are shown in the following table:

Reservoir.	Snowfall during February.	Depth of snow Mar. 1.
	Inches.	Inches.
Keechelus.....	53	55
Kachess.....	22	35
Cle Elum.....	10	20
Bumping.....	35	51

Maintenance, Sunnyside Division.—Maintenance work was confined to cutting willows on main and branch canals and wasteways, cleaning and painting gates, and repair and renewal of wooden structures. Some concrete work was started at the end of the month. About 800 cubic yards of rock were placed at the main canal headworks. Overhauling of the pumping plants continued, and good progress was made on necessary repairs.

Maintenance, Tieton Division.—The patrol force was engaged in cutting willows. Material for 2,000 linear feet of 30 and 36 inch wood-stave flume on Lateral B was delivered at the site, including sand and gravel for the pedestals and inlet and outlet structures.

Storage reservoirs.—At Keechelus, Kachess, and Cle Elum the gates were closed throughout the month. At Bumping Lake the gates were operated to hold the lake surface level until the 14th. From the 14th to the end of the month water was released for use by the Pacific Power & Light Co.

New divisions.—Work was continued on plans and estimates for the proposed Roza Division.

Miscellaneous.—The project manager and District Counsel Holgate were in Olympia, Wash., on February 17 and 18 for a conference with the State supervisor of hydraulics and the attorney general relative to water diversions on the Yakima River.—*J. L. Lytel*.

TIETON DAM.

Continued cold and snow during February rendered outside construction work difficult. An average of 12 inches of snow was on the ground throughout the month. Road conditions were such that heavy truck hauling was impossible.

Good progress was made on the core-wall excavation and the placing of concrete therein. One steam shovel was engaged in excavation of the core wall and in stripping, although hampered somewhat by frost conditions. The cableway head tower was erected and material hauled for the machinery base and the anchorage. The power plant operated continuously, though ice was troublesome. No trouble was experienced in securing sufficient labor.—*F. T. Croyce*.

Crop report, Sunnyside division, Yakima project, Washington, 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	41,534	Ton.....	176,520	4.25	\$8.00	\$1,412,160	\$34.00
Apples.....	10,448	Pound.....	107,718,880	10,310	.03	3,231,566	309.30
Barley.....	453	Bushel.....	13,137	29	.40	5,255	11.60
Beets, sugar.....	1,827	Ton.....	9,135	5	6.00	54,810	30.00
Corn, Indian.....	4,177	Bushel.....	150,372	36	.60	90,223	21.60
Corn, fodder.....	356	Ton.....	3,204	9	4.00	12,816	36.00
Corn, ensilage.....	294	do.....	3,528	12	7.00	24,696	84.00
Fruit, small.....	401	Acre.....			325.00	130,325	325.00
Garden.....	2,015					403,000	200.00
Hay, other than alfalfa.....	1,301	Ton.....	3,253	2.5	9.00	29,277	22.50
Hops.....	138	Pound.....	345,000	2,500	.30	103,500	750.00
Oats.....	337	Bushel.....	17,524	52	.40	7,010	20.80
Pasture.....	5,980					89,700	15.00
Peaches.....	903	Pound.....	3,475,647	3,849	.04	139,026	153.96
Pears.....	1,614	do.....	11,602,309	7,193	.03	348,070	215.79
Prunes.....	382	do.....	2,097,562	5,491	.05	104,878	274.55
Potatoes.....	7,032	Bushel.....	2,109,600	300	.70	1,476,740	210.00
Rye.....	102	do.....	1,938	19	.90	1,744	17.10
Wheat.....	4,970	do.....	139,160	28	.95	132,204	26.60
Less duplicated areas.....	3,584						
Total cropped.....	80,680	Total and average.....				7,797,000	96.65
Young orchard.....	814						
Young alfalfa.....	2,386						
House and corral.....	3,140						
Town-site area.....	1,950						
Irrigated without crop.....	6,470						
Less duplicated areas.....	940						
		Areas.			Acres.	Farms.	Per cent of project.
		Total irrigable area farms reported.....			94,500	3,065	87.82
		Total irrigated area farms reported.....			94,500	3,065	87.82
		Under water-right applications.....			32,310	1,029	30.03
		Under rental contracts.....			62,190	2,036	57.80
Total irrigated.....	94,500	Total cropped area farms reported.....			80,680	3,065	75.00

RIVERTON PROJECT, WYOMING.

The precipitation during February was 0.08 inches, all of which fell as snow. There were about 2 inches of snow on the ground at the end of the month. The roads were in fair condition throughout the month. The weather was unfavorable for construction. The flow of Wind River was about normal.

Drag line 121474 was operated on the Wyoming Canal throughout the month, beginning work on the Second Division. This machine moved 15,521 cubic yards, all from the canal prism, of which 537 cubic yards was class 1 sandy loam, and 14,984 cubic yards class 3 sandstone. Two drill crews were employed blasting sandstone ahead of this machine.

Only general preparatory work was done on the Wind River Diversion Dam.

One survey party was employed at Pavillion on investigations.—*H. D. Comstock.*

SHOSHONE PROJECT, WYOMING.

February was an unusually cold and disagreeable month. The cold weather caused much interruption of outside work.

The Shoshone River was at a low stage the entire month, and the water surface in Shoshone Reservoir dropped 0.1 feet during the month.

The only maintenance work during the month by Government forces consisted of chopping ice from around Ralston Reservoir outlet tower, keeping the ice down in the Garfield Canal wasteway to prevent the drain water which discharges into the canal from overflowing adjacent farm lands and some inspection of open drains. The contractor engaged upon hauling cobble rock to certain Garland Canal drops delivered 120 cubic yards of rock during the month, nearly com-

pleting his contract. The permanent organization was engaged upon compiling hydrographic and project history data.

The surplus hay on the project was disposed of and considerable wheat and potatoes were also marketed. The following shipments were made during the month: Alfalfa meal, 64 cars; alfalfa hay, 247; oats, 2; wheat, 8; potatoes, 17; honey, 1; live stock, 1.

The principal field work was on irregular subdivision surveys of the Willwood Division. Office work was in connection with the above surveys, preparation of data for a report on the Garland Division drainage situation, preparation of material for the project history, and other reports and work in connection with power plant and transmission line construction.

The only construction under way during the month was on the power plant and transmission line. It was greatly hindered and delayed by the cold weather. The connection of the 42-inch pipe through the base of the dam to the emergency valves was concreted in place and the emergency valves were closed, thus giving complete control of these two pipes. The erection of the steel penstocks was completed, but some riveting and calking and also the painting remain to be done. The concrete work on the north wall and roof of the power house was completed. The roof truss extensions to the cliff north of the power house were raised to place. Considerable work was done on the erection of the miscellaneous steel work in the power house and by-pass house and in the installation and wiring of the electrical equipment. One hundred and ten cubic yards of back fill were placed to the east of the power house. One hundred and forty-one cubic yards of concrete were placed during the month.

On the transmission line work was continued on the portion between Powell and Deaver; 6.5 miles of line were completed during the month. The foundations

Crop report, Tieton Division, Yakima project, Washington, 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Per unit of yield.	Values.	
			Total.	Average per acre.		Total.	Per acre.
Alfalfa hay.....	13,350	Ton.....	40,996	3.1	9.00	\$368,964	\$27.65
Apples.....	7,160	Pound.....	58,852,305	8,220.0	.035	2,059,836	287.70
Barley.....	635	Bushel.....	20,280	31.9	.55	11,154	17.55
Beans.....	24	do.....	545	22.7	2.40	1,308	54.50
Beets, sugar.....	43	Ton.....	377	8.8	6.00	2,262	52.60
Corn.....	724	Bushel.....	26,604	36.7	.55	14,632	20.20
Corn, ensilage.....	206	Ton.....	2,240	10.9	4.50	10,080	48.95
Corn, fodder.....	85	do.....	279	3.3	2.00	558	6.55
Fruits, small.....	215	Pound.....	498,445	2,320.0	.10	49,844	231.85
Garden.....	250	Acre.....	.....	.....	100.00	25,000	100.00
Hay, except above.....	520	Ton.....	679	1.3	9.00	6,111	11.75
Hops.....	262	Pound.....	308,400	1,180.0	.25	77,100	294.25
Oats.....	352	Bushel.....	11,402	32.4	.40	4,560	12.95
Onions.....	25	do.....	8,240	330.0	1.80	14,832	593.30
Pasture.....	1,415	Acre.....	.....	.....	20.00	28,300	20.00
Peaches.....	534	Pound.....	3,606,858	6,755.0	.04	144,270	270.20
Pears.....	1,574	do.....	5,512,500	3,500.0	.0225	124,031	78.80
Potatoes.....	1,410	Bushel.....	247,286	175.0	.65	160,735	114.00
Wheat.....	2,442	do.....	66,140	27.1	.95	62,833	25.75
Less duplicated areas.....	4,026						
Total cropped.....	27,200	Total and average.....				3,166,410	116.40
Young orchard.....	1,442	Areas.....			Acres.....	Farms.....	Per cent of project.
Young alfalfa.....	576						
Irrigated without crop.....	45						
Building sites and miscellaneous.....	523						
Less duplicated areas.....	1,286	Total irrigable area farms reported.....			30,800	1,300	96.2
Total irrigated.....	28,500	Total irrigated area farms reported, under water-right applications.....			28,500	1,300	89.1
		Total cropped area farms reported.....			27,200	1,300	85.0

for the steel towers in Shoshone Canyon were also completed.

The annual meeting of the Frannie Division Water Users' Association was held on February 18 and a new board of directors was elected.—*J. S. Longwell.*

INDIAN PROJECTS, MONTANA.

BLACKFEET PROJECT.

Cold winter weather prevailed during almost the entire month of February. The temperature averaged considerable below normal; and while there were no extremely severe storms there were no thaws of any consequence, and it was impossible to carry on any field work. No field camps were operated during the month and no field men were employed.

There were no farming operations of any kind other than the feeding of stock and the hauling of a small amount of grain to market.—*R. M. Snell.*

FLATHEAD PROJECT.

February weather was very severe during the latter part of the month.

Cement hauling for contract No. 858, for Dry Creek Canal lining, was completed during the first part of the month. Practically all of the available hay on the project had been sold at the end of the month.—*C. J. Moody.*

FORT PECK PROJECT.

February was colder than usual.

No construction work was in progress.

The price of wheat advanced a few cents during the month, but there was not much left to market. Live stock on the range suffered from the low temperatures, and the hay supply was considerably reduced.—*S. A. Kerr.*

Comparison between operation and maintenance estimates and results, January 1 to February 28, 1922.

Projects.	Gross costs.				Net accruals and revenues.				Area for which water is available (acres).
	Estimate for 1922.		Actual cost to Feb. 28.	Amount *over or under	Estimate for 1922.		Actual returns to Feb. 28.	Amount more or *less than estimate.	
	Total for year.	To Feb. 28.			Total for year.	To Feb. 28.			
PROJECTS UNDER PUBLIC NOTICE.									
Belle Fourche.....	\$70,000	\$3,000	\$5,000	*\$2,000	\$101,153				\$82,500
Boise.....	290,000	34,000	16,000	18,000	1 280,000				167,300
Carlsbad.....	52,000	8,500	8,000	500	1 56,625	\$1,000	\$700	*\$300	25,000
Huntley.....	45,000	5,000	3,000	2,000	2 47,000				30,000
King Hill.....	35,500	(3)	(3)	(3)	4 35,500		(3)	(3)	16,900
Klamath.....	55,000	1,500	2,000	*500	4 55,000	4 1,500	4 2,000	4 500	51,000
Lower Yellowstone.....	36,000	1,500	1,100	400	4 36,000	4 1,500	4 1,100	4 *400	40,200
Minidoka (south side).....	94,000	8,000	7,000	1,000	95,300				49,000
Newlands.....	105,000	15,000	13,000	2,000	2 121,000				72,200
North Dakota pumping.....	35,000	(3)	(3)	(3)	30,820	(3)	(3)	(3)	7,650
North Platte (Interstate).....	165,000	10,000	10,000		2 166,700				130,000
Okanogan.....	37,000	2,500	1,500	1,000	4 53,720	4 19,220	4 18,220	4 *1,000	8,460
Orland.....	35,000	5,700	2,800	2,900	35,230				20,500
Rio Grande.....	231,000	74,000	63,000	11,000	4 233,945	4 76,945	4 65,945	4 *11,000	116,000
Shoshone.....	70,000	4,500	3,800	700	2 74,446				71,100
Strawberry Valley.....	25,000	4,000	3,600	400	8 52,500	300	500	200	59,100
Sun River (Fort Shaw).....	15,500	1,700	400	1,300	2 15,400				13,900
Umatilla.....	37,280	4,500	2,000	2,500	4 37,280	4 4,500	4 2,000	4 *2,500	24,400
Yakima:									
Sunnyside.....	130,000	20,000	17,000	3,000	1 148,776				103,000
Tieton.....	84,000	8,500	8,500		89,800				32,000
Yuma.....	260,000	26,000	26,000		1 275,000	16,000	15,000	*1,000	63,200
Total.....	1,907,280	237,900	193,700	44,200	2,041,195	120,965	105,455	*15,500	1,183,410
PROJECTS UNDER WATER RENTAL.									
Grand Valley.....	50,000	3,000	3,500	*500	50,800				38,400
Milk River (including St. Mary).....	71,500	6,500	3,200	3,300	2 22,000				74,000
North Platte (Fort Laramie).....	70,000	8,500	8,500		2 53,000	2,000	2,000		43,400
Sun River (Greenfields and Big Coulee).....	25,000	800	800		2 30,000				28,500
Uncompahgre.....	135,000	22,000	24,800	*2,800	142,500	2,000	2,000		100,000
Total.....	351,500	40,800	40,800		298,300	4,000	4,000		281,300
INDIAN PROJECTS.									
Blackfeet.....	30,000				19,700				21,500
Flathead.....	69,740	1,000	300	700	2 69,740				105,000
Fort Peck.....									(22,400)
Total.....	99,740	1,000	300	700	89,440				126,500

¹ Tentative; subject to check by project.

² Tentative; announcement of charges not yet received.

³ Report not received from project in time for publication.

⁴ Returns regulated in accordance with district contract.

⁵ Estimated by Denver office.

⁶ Includes 17,000 acres for which water is carried in main canal.

⁷ Not including tunnel repairs.

⁸ Includes installment of \$25,000 for tunnel repairs.

⁹ Stored water is furnished through St. Mary Canal for 21,600 acres additional.

GENERAL OFFICES.

Washington office.—Director Davis was in charge of the office during the entire month except for the last two days, when he was at Yale University delivering a course of lectures before the Sheffield Scientific School. During his absence the office was in charge of Assistant Director Morris Bien as acting director. The chief counsel was in the office the entire month.

The director's revised report under the Kinkaid Act, regarding the development of the Colorado River, was presented to the Secretary on February 4. During the month the service was called on for a large amount of data and information in connection with the first sessions of the Colorado River Commission held in Washington. Hon. Herbert Hoover was made chairman, and the commission divided into committees to consider legal questions, water supply, and water demands.

On February 15 the director appeared before the Committee on Irrigation of Arid Lands of the House of Representatives in connection with the draft of a bill approved by the Secretary regarding extension of time on project repayments.

During the month 91 purchase orders were placed and 6 advertisements issued. Purchases amounted to \$2,328.42. The storehouse filled 194 requisitions and made 39 sales from stock, the total value amounting to \$1,934.74.

Publications issued during the month comprised 89 copies of the annual report and 3,050 miscellaneous reports and documents.

The Photographic Laboratory turned out work to the value of \$250.95, distributed as follows: Washington office, \$57.15; field, \$47.10; sales, \$146.70.

Action was taken by the Secretary on the following matters, among others, submitted to him:

Reporting favorably, with suggested redraft, on bills H. R. 9606, S. 2904, and S. J. Res. 158, to authorize the Secretary of the Interior to extend the time for payment of construction charges; signed February 10.

Recommending approval as to form of draft of contract with the Truckee-Carson Irrigation District relative to deficit of \$189,902.55 on operation and maintenance charges; approved February 8.

Recommending approval of form of contract with the water users on the Frannie Division, Shoshone project, providing for the collection of the cost of necessary drainage work as supplemental construction charges, amounting to not more than \$30 per irrigated acre, or approximately \$852,666; approved February 16.

Recommending that the request of the directors of the Truckee-Carson Irrigation District that construction of the Diagonal Drain be deferred for at least a year be denied; approved February 16.

Reporting favorably, with suggested amendments, on bill S. 3117 relative to lease of surplus electric power on Federal irrigation projects, extending the 50-year leasing right to all Federal irrigation projects; signed February 18.

Recommending approval of general form of applications for temporary water service; approved February 24.

Transmitting to the Speaker of the House and the President of the Senate the report on irrigation from the Colorado River; signed February 28.

Recommending approval of public notices announcing water charges for the irrigation season of 1922, and thereafter until further notice on the Carlsbad, Umatilla, Rio Grande, Yakima, Orland, Grand Valley, Yuma, Minidoka, and Strawberry Valley projects; approved on various dates during the month.

Denver office.—The chief engineer left for Washington, D. C., on February 4 and returned on February 21. Assistant Chief Engineer Williams spent the entire month on the Montana projects.

The principal work accomplished in the Designing Division during the month consisted of the completion of revised designs on the Boulder Canyon Reservoir, with capacities of 24,800,000, 33,600,000, and 31,400,000 acre-feet; preliminary designs and estimates for main canal tunnels on the Baker secondary project; partial preparation, preliminary designs for siphon, and preliminary designs and estimates for Thief Valley Reservoir; studies for detail design of dam and outlet works for the Pilot Butte Reservoir, Riverton project; and continued work on final designs for spillway, Yakima storage. The report on high-pressure reservoir outlets was completed.

The principal work accomplished in the Electrical Division consisted of practically completing drawings of the Thomas Point pumping plant, and an estimate was prepared of the cost of the American Falls power plant. General arrangement drawings of the Shoshone power plant were completed; designs were begun for emergency gates and 60-inch needle valves for the Tieton Dam. A further study was given to the preliminary design of the Pilot Butte power plant, Riverton project. This section also completed its portion of the report on high-pressure reservoir outlets.

The Cost and Property Section arranged for the transfer of approximately \$16,000 worth of equipment and supplies between projects, and also arranged for the sale of over \$200 worth of small miscellaneous equipment.

Among the more important matters considered in the Legal Section during the month were proposed termination of contracts with those holding unproductive lands on the Huntley project; contracts with those having excess holdings, Sun River project; operation and maintenance charges for the season 1922 on several projects under irrigation district contracts; also preparation of contracts with the proposed irrigation district, Belle Fourche project, Horsefly Irrigation District, Klamath project, and proposed contract with the Huntley Irrigation District.—*F. E. Weymouth.*

Recent Reclamation Service Orders and Announcements.

CIRCULAR LETTERS.

- No.
1081. Execution of transportation requests.
1082. Old series of Reclamation Service bills of lading.
1083. Transmittal of personnel papers.
1084. Changes in irrigable areas. Approval of irrigation districts.
1085. Final water-right certificates and certificates of full payment and release of lien.
1086. Manual amendment: Right-of-way descriptions in contracts and deeds.
1087. New form for general ledger sheet.
1088. Standard form of application for temporary water service.

GENERAL LETTERS.

210. Engineering articles for RECLAMATION RECORD.

GENERAL ORDERS.

274. Allotments and budget report.

ADMINISTRATIVE ORGANIZATION.

DEPARTMENT OF THE INTERIOR.

Hon. ALBERT B. FALL, Secretary of the Interior.
 EDWARD C. FINNEY, First Assistant Secretary.
 FRANCIS M. GOODWIN, Assistant Secretary.
 EDWIN S. BOOTH, Solicitor for the Interior Department.
 CHARLES V. SAFFORD, Administrative Assistant to the Secretary.
 CHARLES W. NESTLER, Administrative Assistant to the Secretary.
 HARRY G. CLUNN, Private Secretary to the Secretary.
 JOHN HARVEY, Chief Clerk and Superintendent of Buildings.

U. S. RECLAMATION SERVICE.

WASHINGTON, D. C.

Arthur Powell Davis, director; Morris Bien, assistant director; Ottamar Hamel, chief counsel; J. B. Beadle, director's assistant; C. J. Blanchard, statistician; Hugh A. Brown, editor and office assistant; C. A. Bissell, engineer; C. A. Lyman, acting chief accountant; Miss H. A. Fellows and Raymond Depue, fiscal agents; C. H. Fitch, chief clerk; Emmet Carr, purchasing agent; G. W. Numbers, appointment clerk; H. N. Bickel, Yakima, Wash., W. A. Meyer, Denver, Colo., and W. F. Kubach, Great Falls, Mont., examiners of accounts.

DENVER, COLO.

F. E. Weymouth, chief engineer, Tramway Building, Denver, Colo.; R. F. Walter and C. P. Williams, assistant chief engineers; Miss L. H. Meisel, secretary to the chief engineer; J. M. Gaylord, electrical engineer; J. L. Savage, designing engineer; James Munn, engineer; J. L. Burkholder, drainage engineer; J. M. Luney, chief clerk; A. McD. Brooks, purchasing agent; Harry Caden, fiscal agent.

FIELD LEGAL OFFICES.

Boise, Idaho.—B. E. Stoutmyer, district counsel. Projects: Boise, Minidoka, King Hill, and Jackson Lake Enlargement; R. M. Patrick, district counsel, located at American Falls, Idaho.

Denver, Colo.—Law section office of chief engineer: E. E. Roddis and Armand Offutt, district counsel.

El Paso, Tex.—P. W. Dent, district counsel. Projects: Rio Grande, Carlsbad, and Hondo.

Las Cruces, N. Mex.—Mark B. Thompson, attorney in charge of litigation on Rio Grande and Carlsbad projects.

Helena, Mont.—W. J. Egleston, district counsel, Helena, Mont. Projects: Blackfeet, Flathead, Fort Peck, Huntley, Milk River, St. Mary Storage, Sun River, North Dakota Pumping, Lower Yellowstone, and Shoshone.

Mitchell, Nebr.—J. N. Beardslee, district counsel. Projects: North Platte and Belle Fourche.

Montrose, Colo.—J. R. Alexander, district counsel, Projects: Grand Valley, Uncompahgre, and Strawberry Valley.

Portland, Oreg.—H. L. Holgate and D. G. Tyree, district counsel. Projects: Yakima, Okanogan, Umatilla, and Klamath.

San Francisco, Calif.—Henry A. Cox and Brooks Fullerton, district counsel, 349 Pacific Building. Projects: Salt River, Yuma, Orland, and Newlands.

PROJECT ORGANIZATION.

Belle Fourche Project.—B. E. Hayden, project manager, Newell, S. Dak.; R. C. Walber, chief clerk; August Lewin, fiscal agent.

Boise Project.—J. B. Bond, project manager, Boise, Idaho; E. R. Mills, chief clerk; C. F. Weinkauff, fiscal agent.

Carlsbad Project.—L. E. Foster, project manager, Carlsbad, N. Mex.; V. L. Minter, chief clerk and fiscal agent.

Grand Valley Project.—S. O. Harper, project manager, Grand Junction, Colo.; C. H. Young, chief clerk; A. H. Hall, fiscal agent.

Huntley Project.—A. R. McGinness, project manager, Ballantine, Mont.; G. H. Bolt, chief clerk; Miss M. C. Simek, fiscal agent.

King Hill Project.—Walter Ward, project manager, King Hill, Idaho; T. W. Hause, chief clerk; L. D. Eakin, fiscal agent.

Klamath Project.—H. D. Newell, project manager, Klamath Falls, Oreg.; N. G. Wheeler, chief clerk; G. R. Barnhart, fiscal agent.

Lower Yellowstone Project.—L. H. Mitchell, project manager, Savage, Mont.; C. A. Denman, chief clerk.

Milk River Project.—G. E. Stratton, project manager, Malta, Mont.; H. A. Parker, engineer; E. E. Chabot, chief clerk; G. S. Moore, fiscal agent.

Minidoka Project.—Barry Dibble, project manager, Burley, Idaho; Dana Templin, engineer; B. C. Diehl, chief clerk; Miss A. J. Larson, fiscal agent; F. A. Banks, engineer, American Falls, Idaho.

Newlands Project.—J. F. Richardson, project manager, Fallon, Nev.; A. W. Walker, engineer; G. B. Snow, chief clerk and fiscal agent.

North Dakota Pumping Project.—W. S. Arthur, project manager and chief clerk, Williston, N. Dak.; H. C. Melas, fiscal agent.

North Platte Project.—Andrew Weiss, project manager, Mitchell, Nebr.; H. W. Bashore, engineer, Fort Laramie Division; Paul Roth, irrigation manager; J. R. Ummel, chief clerk; Miss A. L. Perrine, fiscal agent.

Okanogan Project.—Calvin Casteel, project manager, Okanogan, Wash.; W. D. Funk, chief clerk and fiscal agent.

Orland Project.—R. C. E. Weber, project manager, Orland, Calif.; E. T. Eriksen, engineer; C. H. Lillingston, chief clerk and fiscal agent.

Rio Grand Project.—L. M. Lawson, project manager, El Paso, Tex.; T. W. Parry, irrigation manager; C. A. Peavey, chief clerk; L. S. Kennicott, fiscal agent.

Riverton Project.—H. D. Comstock, project manager, Riverton, Wyo.; R. M. Conner, engineer; G. H. Murphy, chief clerk; Miss Grace McCarthy, fiscal agent.

St. Mary Storage Division.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk; H. E. Bruce, fiscal agent.

Salt River Project.—Being operated by the Salt River Valley Water Users' Association; C. C. Cragin, general superintendent and chief engineer, Phoenix, Ariz.

Shoshone Project.—J. S. Longwell, project manager, Powell, Wyo.; J. R. Iakisch, engineer; C. M. Jump, superintendent of irrigation; W. F. Sha, chief clerk; Miss L. C. Drinkwater, fiscal agent.

Strawberry Valley Project.—W. L. Whittemore, project manager, Provo, Utah; J. E. Overlade, chief clerk and fiscal agent.

Sun River Project.—G. O. Sanford, project manager, Great Falls, Mont.; H. W. Johnson, chief clerk; Miss M. G. Valentine, fiscal agent; G. A. Benjamin, irrigation manager, Fairfield, Mont.

Umatilla Project.—H. M. Schilling, project manager, Hermiston, Oreg.; G. C. Patterson, chief clerk and fiscal agent.

Uncompahgre Project.—L. J. Foster, project manager, Montrose, Colo.; A. H. Peach, chief clerk and fiscal agent.

Yakima Project.—J. L. Lytel, project manager, Yakima, Wash.; R. K. Cunningham, chief clerk; J. C. Gawler, fiscal agent; M. D. Scroggs, superintendent of irrigation, Sunny-side, Wash.; J. S. Moore, superintendent of irrigation, Route 6, Yakima, Wash.; F. T. Crowe, engineer in charge construction Tieton Dam, Rimrock, Wash.; C. E. Crownover and C. F. Gleason, engineers; V. G. Evans, chief clerk; C. B. Funk, fiscal agent.

Yuma Project.—P. J. Preston, project manager, Yuma, Ariz.; R. M. Priest, superintendent of construction; S. A. McWilliams, engineer, Yuma Mesa Division; E. R. Schepplermann, chief clerk; E. M. Phillebaum, fiscal agent.

INDIAN PROJECTS.

Blackfeet Project.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk and fiscal agent.

Flathead Project.—C. J. Moody, project manager, St. Ignatius, Mont.; J. M. Swan, chief clerk; J. P. Siebeneicher, fiscal agent.

Fort Peck Project.—S. A. Kerr, project manager, Poplar, Mont.; Henry Berryhill, chief clerk and fiscal agent.

The Reclamation Record

An ADMINISTRATIVE and STATISTICAL REPORT

Issued Monthly by the RECLAMATION SERVICE, DEPARTMENT OF THE INTERIOR, Washington, D. C.

CERTIFICATE: By direction of the Secretary of the Interior the matter contained herein is published as administrative (or statistical) information and is required for the proper transaction of the public business.

VOLUME 13, No. 4

APRIL, 1922

REPORT ON THE DESIGN, CONSTRUCTION, AND LIFE OF METAL FLUMES.

The Results of a Questionnaire to Six Reclamation Projects.

UNDER date of November 20, 1920, a questionnaire on the design, construction, and life of metal flumes was sent to six projects of the Reclamation Service on which considerable quantities of metal flume are installed. A report by former Project Manager Fred D. Pyle, published in the November, 1920, RECLAMATION RECORD, on the "Inspection of Metal Flumes, Uncompahgre Project," brought out the fact that very little information has been put on record regarding the life and general performance of this type of flume, and the questionnaire was prepared to bring together the available data upon flumes in service.

It is very difficult to secure by a questionnaire of this kind full and complete data upon any subject. The opinions and personal experiences of constructing and operating engineers constitute the most valuable source of information and it is impossible to anticipate all such experiences in the selection of questions. Dependence must be placed upon a large and inviting space for notes. On the whole, the responses to the flume questionnaire were satisfactory, but some of the forms were filled in without comments and were incomplete in minor parts. All questionable data are omitted from the tabulations. For this reason the totals of the linear feet of flume given in the various tables do not in all cases agree.

The questionnaire covered the following points:

Location of flume:

- Canal.
- Station.

Date flume metal installed.

Age of flume metal.

Hydraulic properties:

- Designed capacity, second-feet.
- Water depth at designed capacity.
- Velocity at designed capacity.

Alignment:

- Linear feet on curve.
- Linear feet on tangent.

Does water carry silt?

- In suspension.
- Rolling along bottom.

Is metal or paint eroded by silt?

Dimension of flume and accessories (metal work):

- Type of joint.
- Size number.
- Diameter.
- Distance c. to c. of joints.

Flume sheet—

- Gage of metal.
- Kind of metal.
- Galvanized or not.

Joint suspension rod—

- Number per joint.
- Diameter in body.
- Diameter in thread.
- Threads rolled or cut.
- Galvanized or not.

Intermediate suspension rod—

- Number per flume sheet.
- Diameter in body.
- Diameter in thread.
- Threads rolled or cut.
- Galvanized or not.

Compression bars—

- Number per joint.
- Shape.
- Size.
- Galvanized or not.

Washers—

- Type.
- Size.

Shoes—

- Material.
- Bearing area on cross beam.

Expansion joints—

- Type.
- Spacing.
- Maximum movement.
- Do you consider necessary?

Metal carrier beam—

- Shape.
- Size.

Footings:

- Type.
- Condition.

Dimensions of timber trestle:

- Size of substructure timbers—
 - Posts.
 - Stringers.
 - Knee braces.
 - Cross braces.
 - Longitudinal braces.

Dimensions of timber trestle—Continued.

Size of carrier beams—

At joint rods.

At other rods.

Painting:

Flume sheets—

Dates painted.

Kind of paint.

Describe results.

Trestle—

Dates painted.

Kind of paint.

Describe results.

Repairs:

Describe repairs made—

Flume.

Trestle.

Describe good or bad points of design.

Notes and discussion.

A summary of the results of this questionnaire is shown in Tables 1, 2, and 3.

Referring to Table 1, column 2 gives the total linear feet of the various sizes of flume reported upon, and columns 3 to 10 show the distribution of the installations among the different types of flumes. The figures shown do not represent the total lengths of flume installed by the Reclamation Service,¹ but only the lengths covered by the reports.

Columns 11 to 16 give the gage of sheets used with the various sizes of flume. No comments are offered as to the sufficiency of these thicknesses.

Columns 17 to 23 give the sizes of joint suspension rods reported, and columns 24 to 27 show the sizes of intermediate suspension rods and the linear feet of each size of flume upon which intermediate rods are used. Columns 28 and 29 show the proportion of galvanized rods.

The kind of threads (rolled or cut) used on the rods is omitted from the summary on account of lack of confidence in the data submitted. Two sheets out of sixteen report all threads as rolled, one leaves the column blank, one reports "not determined," a part of one says "standard," and all others report cut threads. Cut threads are reported for probably 75 per cent of the flumes listed. Information obtained from other sources indicates that not less than 95 per cent of all flumes purchased by the Reclamation Service have been supplied with rods having rolled threads. The question is not believed to be of sufficient importance to warrant the expense of reexamining these rods in the field. No failures of suspension rods or of flumes due to the omission of intermediate rods are reported. In a number of cases rusting of the sheets is said to have been hastened by the use of ungalvanized rods.

Columns 30 to 43 give the outside dimensions of washers used on the suspension rods for flumes of various sizes. There is a very evident lack of uniformity in the size of washers used for a given size of flume. No trouble due to crushing of wood under washers is reported for any of the washers shown in

the summary. Both the Uncompahgre and Grand Valley projects report crushing of fibers under washers but these projects give the nominal size of washers only, and only those washers for which actual outside dimensions were given are summarized in Table 1. The Uncompahgre project states that "the bearing area on the carrier beams for both the cut washers on the smaller flumes and the cast washers on the larger flumes are, as a rule, insufficient to carry the load. * * * The crushing of the washers through the fibers of the wood tend to gather rain and snow, and, as a result, rotting action is hastened considerably at these points."

The Grand Valley report carries the following note: "Fibers of carrier beams somewhat crushed under washers * * * and compression shoes. This crushing practically same above and below and probably due to unnecessary tightening."

The bearing strength of the washer should equal the tensile strength of the suspension rod. The relation of washer size to diameter of rod is shown in Table 4. In all cases reported except two the washers are smaller than required by the present United States Reclamation Service specifications. The bearing pressures range from about 200 to 1,300 pounds per square inch. For other purposes 310 pounds per square inch is taken as the working stress for side bearing on fir.

Columns 45 to 69 give the dimension of compression bars reported. No comments are made relative to the sufficiency of these bars. In some cases these are known to have buckled out of place due to insufficient size.

The sizes of shoes are shown in columns 70 to 82 of Table 1, and the relation of these sizes to the sizes of rods is shown in the right-hand part of Table 4.

Columns 83 to 87 give the sizes of carrier beams. The Boise report states that "many carrier beams were small, causing sagging and some breaking," and that several 4 by 4 inch carriers were replaced on a No. 192 flume. No other trouble with carrier beams is noted.

Columns 89 to 100 give the dimensions of timber posts used. Since neither the span nor the height of bents is known, these data are not of great value. No structural failure of posts is reported. A considerable number of posts have been replaced owing to rotting at the bottom, mostly due to earth contact, and several bents have failed owing to "washouts" or foundation settlements. Replacements due to rotting were practically all on painted bents of the earlier installations.

Columns 101 to 111 show the sizes of cross braces used. No comments are offered. Stringer sizes are not given in the summary since they mean little without the corresponding span lengths, which were not called for in the questionnaire. Several stringer failures were reported. On the Boise project old stringers having knee braces spiked and bolted to stringers

¹ 168,211 linear feet of metal flume to Dec. 31, 1920.

TABLE 1.—Metal flumes (linear feet) ; data on construction.

Flume size (inches in semi- circumference).	Linear feet reported.	Type of joint.								Gage of sheets.					
		Maginnis.		Hess.	Wil- hams.	Hin- man.	Len- non.	Ran- kin.	Corru- gated.	22	20	18	16	14	12
		Rough.	Smooth.												
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
36.....	6,045	3,335	.....	898	1,812	.....	.....	.....	.....	5,873	208	.....	.....	.....	.....
48.....	9,584	5,456	.....	3,283	845	.....	.....	.....	.....	9,191	391	.....	.....	.....	.....
60.....	16,534	5,143	2,604	4,440	2,365	1,265	100	617	.....	13,834	2,503	193	.....	.....	.....
72.....	11,014	2,416	.....	8,309	289	.....	.....	.....	.....	8,070	2,944	.....	.....	.....	.....
84.....	14,689	2,464	.....	3,553	1,322	6,570	.....	.....	780	1,065	4,057	264	.....	.....	.....
96.....	8,046	4,980	218	2,848	.....	.....	.....	.....	.....	5,058	2,770	218	.....	.....	.....
108.....	8,692	651	.....	7,351	.....	690	.....	.....	.....	112	7,399	1,081	.....	.....	.....
120.....	3,678	112	.....	2,167	.....	885	514	.....	.....	112	308	3,036	.....	.....	.....
132.....	4,868	968	.....	1,958	.....	1,705	78	159	.....	1,604	1,961	1,303	.....	.....	.....
144.....	4,824	782	.....	3,274	.....	690	78	.....	.....	2,005	909	1,910	.....	.....	.....
156.....	4,293	.....	.....	3,155	.....	930	.....	208	.....	.....	669	4,085	.....	.....	.....
168.....	2,411	280	.....	1,059	.....	.....	.....	1,072	.....	.....	1,338	.....	.....	.....	.....
180.....	576	.....	.....	400	.....	.....	.....	176	.....	.....	400	176	.....	.....	.....
192.....	4,449	3,074	.....	716	.....	660	.....	.....	.....	.....	2,492	1,814	153	.....	.....
204.....	2,755	.....	.....	1,608	.....	.....	.....	1,147	.....	.....	.....	62	2,693	.....	.....
228.....	828	.....	.....	.....	.....	.....	.....	828	.....	.....	.....	.....	828	.....	.....
252.....	416	.....	.....	416	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	416
Total....	103,702	29,661	2,822	45,434	6,633	13,395	770	4,207	780	43,315	24,189	12,561	9,350	3,674	416

Flume size (inches in semi- circumference).	Linear feet reported.	Joint suspension rods.								Intermediate suspension rods.				Rods galvan- ized.	Rods not galvan- ized.
		$\frac{1}{2}$ inch.	$\frac{3}{4}$ inch.	$\frac{1}{2}$ inch.	$\frac{1}{2}$ inch.	$\frac{3}{4}$ inch.	$\frac{1}{2}$ inch.	$1\frac{1}{4}$ inch.	$\frac{3}{4}$ inch.	$\frac{1}{2}$ inch.	$\frac{3}{4}$ inch.	$\frac{1}{2}$ inch.	$\frac{3}{4}$ inch.		
		17	18	19	20	21	22	23	24	25	26	27	28		
36.....	6,045	6,081	.....	.....	.....	.....	.....	.....	690	.....	.....	.....	.....	.....	5,355
48.....	9,584	9,235	.....	347	.....	.....	.....	.....	.....	.....	.....	.....	1,008	.....	8,574
60.....	16,534	6,247	3,742	815	184	.....	.....	.....	.....	.....	.....	.....	1,061	.....	15,478
72.....	11,014	5,459	.....	513	80	.....	.....	.....	.....	.....	.....	.....	1,999	.....	8,891
84.....	14,689	2,826	5,921	2,250	264	.....	.....	.....	.....	.....	.....	.....	1,098	.....	13,600
96.....	8,046	5,849	1,000	979	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8,047
108.....	8,692	.....	7,347	1,245	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8,592
120.....	3,678	1,777	.....	1,850	.....	.....	.....	.....	514	.....	.....	.....	1,103	.....	2,575
132.....	4,868	.....	.....	3,981	128	.....	.....	.....	.....	357	.....	.....	526	.....	4,344
144.....	4,824	.....	.....	769	3,929	127	.....	.....	.....	769	782	.....	.....	.....	4,747
156.....	4,293	.....	.....	930	3,824	.....	.....	.....	.....	1,599	3,045	.....	.....	.....	4,754
168.....	2,411	.....	.....	1,950	.....	.....	.....	.....	447	611	280	.....	.....	.....	1,950
180.....	576	.....	.....	176	400	.....	.....	.....	.....	571	.....	.....	.....	.....	576
192.....	4,449	.....	.....	4,450	.....	.....	.....	.....	.....	1,223	.....	3,227	.....	.....	4,185
204.....	2,755	.....	.....	502	645	1,607	.....	.....	.....	645	564	.....	.....	.....	2,755
228.....	828	.....	.....	.....	828	.....	.....	.....	.....	828	.....	.....	.....	.....	828
252.....	416	.....	.....	.....	.....	.....	.....	416	.....	.....	.....	416	.....	.....	416
Total....	103,702	37,474	18,010	13,709	11,037	6,450	1,607	416	1,651	6,603	4,671	3,643	6,795	95,667	

Flume size (inches in semi- circumference).	Linear feet reported.	Washers—outside dimensions.													
		1-inch dia.	1 $\frac{1}{4}$ -inch dia.	1 $\frac{1}{2}$ -inch dia.	1 $\frac{3}{4}$ -inch dia.	2-inch dia.	2 $\frac{1}{4}$ -inch dia.	2 $\frac{1}{2}$ -inch dia.	2 $\frac{3}{4}$ -inch dia.	3-inch dia.	3 $\frac{1}{4}$ -inch dia.	3 $\frac{1}{2}$ -inch dia.	2 $\frac{1}{2}$ by 3 inch.	4-inch dia.	4 by 6 inch.
		30	31	32	33	34	35	36	37	38	39	40	41	42	43
36.....	6,045	.....	208	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
48.....	9,584	.....	.....	.....	1,008	.....	.....	859	.....	.....	.....	.....	.....	.....	.....
60.....	16,534	.....	.....	.....	328	754	.....	2,687	.....	.....	.....	.....	.....	.....	.....
72.....	11,014	556	1,045	683	1,615	.....	.....	730	.....	.....	.....	.....	.....	.....	.....
84.....	14,689	1,627	.....	480	.....	615	.....	257	.....	.....	.....	.....	.....	.....	.....
96.....	8,046	.....	.....	180	.....	4,894	.....	597	.....	.....	.....	.....	.....	.....	.....
108.....	8,692	.....	.....	.....	.....	.....	.....	817	.....	.....	.....	.....	.....	.....	.....
120.....	3,678	.....	.....	378	.....	350	.....	885	.....	.....	.....	.....	514	.....	.....
132.....	4,868	.....	.....	280	.....	993	.....	945	.....	79	.....	.....	.....	.....	.....
144.....	4,824	.....	.....	.....	.....	2,083	.....	1,754	.....	79	.....	.....	.....	.....	.....
156.....	4,293	.....	.....	.....	.....	110	.....	930	3,045	.....	.....	.....	.....	.....	.....
168.....	2,411	.....	.....	.....	504	108	.....	.....	.....	.....	.....	.....	.....	.....	280
180.....	576	.....	.....	.....	.....	.....	152	.....	.....	176	.....	.....	.....	.....	.....
192.....	4,449	.....	.....	.....	.....	.....	.....	.....	.....	660	153	.....	.....	.....	2,296
204.....	2,755	.....	.....	.....	.....	645	.....	.....	.....	645	.....	1,545	.....	.....	.....
228.....	828	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	416	.....
252.....	416	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total....	103,702	2,183	1,253	2,001	3,455	9,907	152	1,046	3,045	1,639	153	1,545	514	416	2,576

NOTE.—Washers for which nominal dimensions only were reported not included.

Flume size (inches in semi- circumference).	Compression bars.														Hinman.	
	Hess.															
	$\frac{3}{4}$ by $\frac{1}{8}$ inch.	$\frac{3}{4}$ by $\frac{1}{4}$ inch.	$\frac{3}{4}$ by $\frac{3}{8}$ inch.	1 by $\frac{1}{8}$ inch.	1 by $\frac{1}{4}$ inch.	1 by $\frac{3}{8}$ inch.	1 by $\frac{1}{2}$ inch.	$1\frac{1}{2}$ by $\frac{1}{4}$ inch.	$1\frac{1}{2}$ by $\frac{3}{8}$ inch.	$1\frac{1}{2}$ by $\frac{1}{2}$ inch.	$1\frac{1}{2}$ by $\frac{5}{8}$ inch.	2 by $\frac{3}{8}$ inch.	3 by $\frac{3}{8}$ inch.	$\frac{3}{4}$ by inch.	$\frac{3}{4}$ by $\frac{1}{8}$ inch.	
44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	
36.																
48.		512		372	1,008		19									
60.		1,044		558	645		173									
72.				24	3,310											
84.		1,577														
96.		597	1,071		180											
108.								279							690	
120.								378							885	
132.						914		359							945	
144.								79	2,005	1,064					690	
156.	110								3,045						930	
168.											612					
180.																
192.																
204.																
228.												1,545		660		
252.													416			
Total	110	3,730	1,071	954	5,143	914	192	1,095	5,050	1,064	765	1,545	416	660	4,140	

Flume size (inches in semi- circumference).	Compression bars.										Shoes—bearing areas.						
	Len- non.	Maginnis.									Ran- kin.	1 square inch.	1½ square inches.	2 square inches.	2½ square inches.	3 square inches.	
		¾ inch round.	½ inch.	¾ inch.	¾ inch.	¾ by ¾ inch.	1 inch.	1½ by ½ inch.	1½ inch.	¾ inch.							2 inch.
	60.	61	62	63	64	65	66	67	68	69	70	71	72	73	74		
36.		3,448										208					
48.		4,456												44			
60.	100	4,679		464				193	2,411	617	464	2,155		256	1,178		
72.		254	96	517	1,239						613	1,045		24			
84.		1,120		624	615						81	160	885		1,203		
96.				382	4,598			218				241	4,676	360	180		
108.		2,088		276											276		
120.	514			112										320	490		
132.	839	278								159			1,674	367	280		
144.	79			782									3,069		127		
156.										669					208		
168.							280			611				447			
180.										176			280	400			
192.						778	2,295						2,295	563			
204.										1,147					564		
228.										836							
252.																	
Total	1,532	16,323	96	3,157	6,452	778	2,575	411	2,411	4,215	1,158	3,809	12,879	2,781	4,506		

Flume size (inches in semicircumference).	Shoes—bearing areas.								Carrier beams.				
	3 1/2 square inches.	4 square inches.	4 1/2 square inches.	5 square inches.	5 1/2 square inches.	6 square inches.	7 1/2 square inches.	8 square inches.	2 by 4 inch.	3 by 4 inch.	3 by 6 inch.	4 by 4 inch.	4 by 6 inch.
	75	76	77	78	79	80	81	82	83	84	85	86	87
36.				690					6,000				
48.		328		1,027					9,538				
60.		558	264	970					12,233	1,670			
72.		476	80	2,265					9,195			1,125	
84.	42	186	38	1,137					3,734	8,590	105	966	
96.									5,669	1,815		391	
108.		690	152			127			213	5,661		2,494	
120.		1,541	447				366					2,127	
132.		1,423					79		79			2,922	945
144.												4,008	690
156.		930	461		3,045							7,074	930
168.		612				611						1,338	612
180.		176										400	
192.						153						4,340	
204.				645		1,545						564	2,190
228.									828				828
252.								416					416
Total	42	7,610	1,442	6,734	3,045	2,436	524	1,244	46,661	17,927	105	28,279	6,611

Flume size (inches in semi- circumference).	Timber posts.											
	3 by 6 inch.	4 by 4 inch.	4 by 6 inch.	4 by 8 inch.	6 by 6 inch.	6 by 8 inch.	8 by 8 inch.	8 by 10 inch.	8 by 12 inch.	10 by 10 inch.	10 by 12 inch.	10-inch round.
88	89	90	91	92	93	94	95	96	97	98	99	100
36	690	208	5,093		54							
48		1,336	2,710		5,271	122						
60		3,407	5,789		5,344	306						
72		1,732	5,140	556	1,927	530	1,085					
84			3,425	1,357	9,077							
96			4,480		3,168		180					
108			3,076		4,774	52	690					
120					3,148		514					
132					1,467		2,592	760	50			
144					284		3,276					
156					3,253	461	930					110
168							1,562					
180							400					
192							1,376	2,295		668		
204					1,545		313			896		
228										828		
252											416	
Total.....	690	6,703	29,713	1,913	39,312	1,471	12,918	3,055	50	2,392	416	110

Flume size (inches in semi- circumference).	Timber cross braces.											Ditch lining.
	1 by 4 inch.	1 by 6 inch.	2 by 4 inch.	2 by 6 inch.	2 by 8 inch.	2 by 12 inch.	3 by 6 inch.	3 by 8 inch.	3 by 10 inch.	4 by 6 inch.	4 by 10 inch.	
	101	102	103	104	105	106	107	108	109	110	111		112
6.	690			5,310								
8.				9,318								
0.			1,304	13,390			60					
2.			556	8,947	1,182		617					1,615
4.		85	1,357	10,862	954		80					
6.	2,750	1,375		2,921	1,000		298					264
8.				391	4,979							
10.				514	728		2,140	690				
12.				993	1,049	120	885			895		
14.				2,005	1,803		1,134	888		558		
16.					938			890				
18.				280	126		461	3,147				
20.							1,058	378				
22.							400					
24.				2,296	756		1,188	196	660			
26.				789			62	1,147				
28.									828			
30.											416	
Total.....	3,440	1,460	3,217	58,016	13,515	120	8,383	7,336	1,488	1,453	416	1,879

Flume size (inches in semicircumference).	Designed velocity in feet per second.											Paint.		
	1	2	3	4	5	6	7	8	9	12	24	Kind.	Flume sheets.	Tres- ties.
	113	114	115	116	117	118	119	120	121	122	123	124	125	126
36			690	211								Red lead	415	10,693
48		1,902	867	512								Tar	46,140	3,172
60		1,950	5,211	648	2,976	238		193				Creosote		6,455
72	99	513	596	5,773	637	309	1,443				48	Green		9,531
84	180	144	1,871	1,712	6,874	1,258		648		15		None	49,650	69,168
96			4,480	1,722	209	1,103	141					Unknown	3,621	200
108				3,011	264	690	127							
120	16		656		864	1,764								
132				1,034	1,000	1,335	1,168							
144				2,132		156	540	150						
156					461	3,253	930							
168			447			611	280							
180			400											
192			563	153	2,296	660			176					
204			62	1,546	502			645						
228						828								
252			304	112										
Total.....	295	4,509	16,147	17,566	16,083	12,205	4,629	1,636	176	15	48			

NOTE.—A small amount of concrete trestle not listed on account of incomplete data. Stringers and longitudinal braces not listed on account of lack of information on length of span.

sagged down, causing dip in flume. It is recommended that knee braces be carefully fitted and butt plates used on bottom of stringers.

Column 112 shows the amount and size of flume used as ditch lining. These flumes are on the Uncompahgre project and are reported to be rusting and pitting. They were about 6 years old when examined.

The designed velocities reported are given in columns 113 to 123 of Table 1. There is no indication that deterioration is hastened by the higher velocities. Many of the flumes have not been operated to capacity and the sufficiency of freeboards shown has not been tested. A number of cases are reported where trouble resulted from sagging of the flume due to settlement of foundations and to overflow due to crowding the flume, but no mention is made of trouble due to insufficient freeboard at designed capacity with the flume in proper alignment. A lack of uniformity in freeboard provided is clearly shown.

Columns 2 to 9 of Table 2 show the condition of the flume sheets reported, distributed in accordance with their ages. The significance of the classifications in this table and in Table 3 is as follows:

Good.—Sheets reported as sound, showing no leakage at joints or elsewhere, and free from any considerable amount of rusting.

Fair.—Sheets in good serviceable condition, but showing slight leakage at joints, and light pitting, scaling, or rusting.

Poor.—Sheets showing serious leakage at joints or elsewhere, badly pitted or rusted, but which can be made serviceable for a time by repairing with tar, tar paper, or other inexpensive means.

Very poor.—Sheets which are practically useless and must soon be replaced or extensively repaired.

Sheets worn out and replaced.—Self-explanatory. This column is omitted from Table 3, since the gages of the worn-out sheets is not known.

Sheets replaced to increase capacity.—This class includes flumes replaced before being worn out on account of the necessity for increasing the capacity of the canal above that for which the flume was designed. These flumes are not shown in Table 3, since neither the gage nor the condition of the sheets at the time of replacement is known. A considerable proportion of these sheets were 7 years old at the time of replacement.

Condition not stated.—No provision for a report on the condition of sheets was made in the questionnaire, and in a majority of cases no mention of the condition is made. It is probably safe to assume that these flumes are in fair or better condition, since sheets in poor condition seem to have been generally noted. This class is not included in Table 3.

It will be noted that the flumes reported as in poor condition vary in age from 5 to 10 years, and those in very poor condition from 5 to 12 years. No explanation is offered for the poor condition of the newer of these flumes. The flumes listed as worn out and replaced were of the Maginnis rough interior type, installed on the Uncompahgre project, and were destroyed by excessive sand. The velocities which caused their destruction are not known, nor is it known whether or not these sheets were painted.

Table 3 shows the condition of all sheets more than 7 years old for which a definite report was rendered, grouped as to gages. It appears that the majority of these sheets in very poor condition are of 20 and 22 gage. This is probably due to the fact that practically all of the early installations were of these gages.

TABLE 2.—Metal flumes (linear feet) ; data on life.

Age (years).	Flume sheets—linear feet.							Footings—linear feet of flume.					
	Condition.				Replaced.		Condition not stated. ¹	Total.	Condition—concrete.				None or mud sill.
	Good.	Fair.	Poor.	Very poor.	Worn out.	Too small. ¹			Good.	Fair.	Poor.	Very poor.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.....	192						1,671	1,863	1,525				
2.....	1,124	624					34	1,782	1,098				
3.....	1,886					42	1,725	3,653	1,682				
4.....	159	127				590	4,010	4,886	2,876				
5.....	1,059	377	520	998	208	1,304	4,087	8,553	4,014		² 350		2,429
6.....	1,176		1,609		286	690	9,819	13,580	10,081			² 1,546	1,667
7.....	980	561	2,107		686	1,728	4,764	10,240	7,503				86
8.....	382	637	707			656	16,648	19,036	12,427				120
9.....	208	157	177	1,129		192	13,453	15,316	14,840				54
10.....		4,865	96	1,961			7,421	14,343	31,036	4,349			208
11.....		6,616		303			3,115	10,034	2,722	6,673			
12.....				1,600			750	2,350	2,356				
Total.....	7,166	13,964	5,216	5,991	1,180	4,616	67,497	105,630	92,160	11,022	350	1,546	4,564

¹ Replaced with larger flumes to meet demand for increase in capacity of canal.

² Condition not stated; presumably in fair or better condition.

³ On alkali soil.

It is not possible with the data available to show by tabulation the beneficial effect of painting the flume sheets or trestles, but painting of the sheets appears to be essential in many cases. The life of badly rusted and pitted sheets has been materially prolonged by painting with tar on a number of projects, and several projects are painting all flumes regularly at the present time.

On the Grand Valley project flumes left unpainted for 6 years were found to be pitted, and the galvanizing had worn off for a space of about 6 feet in bottom. All inside surfaces and outside bands were then painted with one coat of hot coal tar in winter. Adhesion was good and the thickness of coating varied from $\frac{1}{16}$ inch on vertical surfaces to $\frac{1}{4}$ inch in bottom.

TABLE 3.—*Flume sheets more than 7 years old (lin. ft.).*

Gage.	Condition.			
	Good.	Fair.	Poor.	Very poor.
1	2	3	4	5
22.....		6,767	177	2,450
20.....	208	5,528		1,600
18.....	320	2,959	604	
16.....	62		367	668
14.....	980			

NOTE.—Gage of sheets worn out and replaced not known.

On the Yakima project the galvanizing on the inside was found to scour off and the metal to rust in one season unless the flumes were painted. The water in these flumes carried considerable silt. They recommend that all rods be loosened and flume sheets underneath painted, as the sheets corrode rapidly under the rods.

The Sun River project paints with water gas and coal gas tar in accordance with the Reclamation Service standard specifications.¹ The Uncompahgre project uses commercial coal tar. Very few flumes on the Boise project have been painted. The amount of flume and trestle painted is shown in columns 124 to 126 of Table 1. A little less than half of all flume sheets reported are painted, tar being used for this purpose almost exclusively. The small amount of red lead used did not prove satisfactory in water. It is generally conceded that the inside of the flumes should be painted, while comparatively new, with tar, and that the paint should be renewed at intervals of from one to three years, depending upon conditions.

It appears to be agreed that the kind or brand of metal used in the galvanized sheets is of little importance. All sheets are rapidly destroyed unless protected by galvanizing or painting. A more recent inspection of flumes on the North Platte project with

special reference to the kind of metal used for sheets indicates that all brands are in exactly the same physical condition—well preserved where the paint has adhered to the sheet, but covered with rust spots where exposed.

Ice freezing in the flume in winter is reported to have caused considerable damage to both flume sheets and paint. It is recommended that all flumes be arranged to drain when not in use. The Yakima project reports trouble due to holes shot in the flume by irresponsible boys.

TABLE 4.—*Metal flumes (linear feet); sizes of washers and shoes as related to size of rod.*

Diameter rod.	Diameter of washers (inches).											
	1	1½	1½	1½	2	2½	2½	2½	3	3½	3½	
1	2	3	4	5	6	7	8	9	10	11	12	
1-inch.....	2,183	1,253	1,721	2,951	5,430		2,262					
1-inch.....			280	2,254	152	6,871				79		
1-inch.....				504	2,223		1,328	3,045	255			
1-inch.....									1,305	153		
1-inch.....											1,545	

Diameter rod.	Area of shoes (square inches).											
	1.0	1.5	2	2.5	3.0	4.0	4.5	5.0	5.5	6.0	7.5	8.0
13	14	15	16	17	18	19	20	21	22	23	24	
1-inch.....	1,158	3,408	4,945	324	2,519	476	80	4,247				
1-inch.....		401	2,289	918	600	6,346	637	1,842		127	429	
1-inch.....			5,645	576	1,198	788	725		3,045	611	95	
1-inch.....				963	127			645		153		828
1-inch.....					62					1,545		

The North Platte project is of the opinion that "expansion joints are unnecessary for expansion alone, but are needed to relieve the extra strain in the metal, due to the uneven settlement of the substructure." The Uncompahgre project believes that "the desirability of expansion joints is a mooted question." Some flumes on that project with expansion joints are in excellent condition; others have given trouble. In general they consider expansion joints desirable on all flumes over 150 feet in length, especially for the larger sizes. No other comments on the necessity or desirability of expansion joints are made. It is generally held at the present time that all carrier beams should be nailed to the stringers and expansion joints omitted, except where the flume is carried on comparatively long steel spans.

About three-tenths of the trestles have been painted or creosoted, the results being generally reported as good. A green paint with a white lead base is giving good service on the Uncompahgre project, and the project manager believes that "there is no question but that the use of such paint as a protective coat-

¹ See RECLAMATION RECORD, Jan., 1921, p. 21.

ing is more satisfactory than the method later adopted of dipping all timbers in creosote oil." He has observed that "timbers treated with creosote oil, particularly during the hot summer months, and then placed in the structure tend to draw the sun's rays more rapidly, with the result that checking and other such action is advanced instead of being retarded."

Columns 10 to 14 of Table 2 show the conditions reported for footings. Practically all concrete footings are in good condition. Those in poor and very poor condition are in alkali soils. Considerable trouble has resulted from settlement of footings.

On the Uncompahgre project flumes have been successfully repaired by placing 2 to 3 inches of concrete in the bottom and extending same part way up the sides of the flume. In other cases repairs have been made by lining with tar paper stuck down with tar, and where the sheets are less seriously rusted a heavy coat of tar paint alone has been found to stop leakage. Tar and gravel have also been used for this purpose.

The results of the questionnaire may be roughly summarized as follows:

1. Metal sheets galvanized, manufactured, installed, and maintained as were the earlier metal flumes will last under average conditions from 10 to 12 years. No data are available as to the weight of galvanizing on these old sheets, but they probably carried not more than 1.5 ounces per square foot. The later flumes with heavier coatings and with more careful

painting and maintenance may be expected to show a materially longer life.

2. There appears to be no appreciable difference in the lasting qualities of the various brands of iron and steel used for flume sheets.

3. Rough interior flumes appear to deteriorate more rapidly than smooth flumes, due to disturbances at joints.

4. Light silt in suspension does not in all cases seriously erode the flume sheets, but heavier particles may destroy the sheets in a comparatively short time.

5. Careful consideration should be given in designing flumes to possible future increase in canal capacity.

6. Careful attention should be given to the size of washers and shoes.

7. The present type of concrete footing is generally satisfactory. The size of footing should be increased for soft soils, and special care should be taken to make footings in seeped locations resistant to alkali.

8. Trestle timbers should be of ample size and should be protected with paint or creosote. Posts are liable to rot at the bottom.

9. Sheets should be painted before the galvanizing is destroyed with a coat of water-gas tar followed by one or two coats of coal tar, and a coat of coal tar should thereafter be permanently maintained on the sheets by repainting at intervals of from one to three years.—*Julian Hinds, Engineer, U. S. R. S.*

REPORT ON THE ESTIMATED COST OF PRODUCING ALFALFA ON THE NEWLANDS PROJECT, NEVADA.

RECENTLY Mr. Cline, Agriculturist for the Office of Demonstrations on Reclamation Projects, sent in a report on the estimated cost of producing alfalfa on four farms on the Newlands project. These data have been arranged in the following table:

TABLE 1.—Data on cost of producing alfalfa, Newlands project.

Item.	Farm A.	Farm B.	Farm C.	Farm D.
Acres harvested.....	100	110	60	28
Ton yields per acre.....	4.8	3.4	5.2	5.7
Total yield.....	478	375	314	160
Labor charge.....	\$1,784	\$858	\$1,069	\$266
Water charge.....	425	344	162	120
Taxes.....	250	305	196	64
Interest on investment.....	2,400	1,600	960	700
Depreciation on machinery, buildings, ditches, fences, etc.....	382	250	.....	152
Insurance.....	476	41	.....	40
Overhead.....	1,500	450	.....	.....
Owner's salary.....	.....	.....	.....	.....
Total.....	7,227	3,848	2,387	1,342

It will be noted that the same cost items on the different farms vary greatly; also that items such as overhead, insurance, owner's salary, etc., have been

TABLE 2.—Cost of producing alfalfa, Newlands project, 1921.

Items.	Farm A.	Farm B.	Farm C.	Farm D.
1. Fixed growing costs:				
Interest on investment.....	\$24.00	\$14.55	\$16.00	\$25.00
Water charge.....	4.35	3.15	2.70	4.30
Taxes.....	2.50	2.75	3.25	2.30
Insurance.....	.....	.35	.....	1.40
Depreciation (machinery, buildings, fences, ditches, etc.).....	3.80	2.25	.....	5.40
Total cost per acre.....	34.65	23.05	21.95	38.40
2. Harvesting cost (per ton):				
Mowing, raking, cocking, loading, hauling, and storing.....	3.75	2.30	3.40	1.65
3. Yield per acre (tons).....	4.80	3.40	5.20	5.70
4. Total cost per ton.....	10.97	9.08	7.62	8.39

included in the cost data from some farms and omitted from others, which might make the information appear as though it had little value. However, if the data in Table 1 are grouped into growing costs and harvest costs their interpretation is simplified, especially when the growing costs are reduced to costs per acre and the harvesting costs to costs per ton. This has been done in Table 2. In this table the items of overhead and owner's salary were omitted.

The total cost per ton in Table 2 is arrived at by dividing the total cost of the fixed charges per acre by the yield and then adding the harvesting cost per ton.

Some of the things that Table 2 seems to indicate rather clearly are that the returns from the crops

being grown do not justify the present inflated land prices (\$240 to \$415 per acre); that irrigation water is not being used on all farms economically, and that the cost of production decreases as the yield increases.

The statement with reference to high land prices is well supported when the cost data for producing alfalfa and the returns from the crop are studied. The cost of putting alfalfa in the stack ranged from \$7.62 per ton on Farm C to \$10.97 per ton on Farm A. For this same alfalfa hay the growers received \$9 per ton on board cars at shipping point. Deducting baling and hauling charges, the grower realized between \$5 and \$6 only in the stack for his alfalfa, with production costs still against it. When he deducts his production costs he is forced to take a loss of from

TABLE 3.—*Net cost of alfalfa per ton in stack with different rates of growing cost and harvesting cost.*

[Growing cost + yield + harvesting cost = net cost per ton in stack.]

Fixed growing costs per acre.	Harvesting costs per ton.	Cost per ton at various yields.										
		2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7
\$5.00	\$1.50	\$4.00	\$3.50	\$3.17	\$2.93	\$2.75	\$2.61	\$2.50	\$2.41	\$2.33	\$2.27	\$2.23
	2.00	4.50	4.00	3.67	3.43	3.25	3.11	3.00	2.91	2.83	2.77	2.73
	2.50	5.00	4.50	4.17	3.93	3.75	3.61	3.50	3.41	3.33	3.27	3.23
	3.00	5.50	5.00	4.67	4.43	4.25	4.11	4.00	3.91	3.83	3.77	3.73
	3.50	6.00	5.50	5.17	4.93	4.75	4.61	4.50	4.41	4.33	4.27	4.23
10.00	4.00	6.50	6.00	5.67	5.43	5.25	5.11	5.00	4.91	4.83	4.77	4.73
	1.50	6.50	5.50	4.83	4.36	4.00	3.72	3.50	3.32	3.17	3.04	2.93
	2.00	7.00	6.00	5.33	4.86	4.50	4.22	4.00	3.82	3.67	3.54	3.43
	2.50	7.50	6.50	5.83	5.36	5.00	4.72	4.50	4.32	4.17	4.04	3.93
	3.00	8.00	7.00	6.33	5.86	5.50	5.22	5.00	4.82	4.67	4.54	4.43
15.00	3.50	8.50	7.50	6.83	6.36	6.00	5.72	5.50	5.32	5.17	5.04	4.93
	4.00	9.00	8.00	7.33	6.86	6.50	6.22	6.00	5.82	5.67	5.54	5.43
	1.50	9.00	7.50	6.50	5.79	5.25	4.83	4.50	4.23	4.00	3.81	3.64
	2.00	9.50	8.00	7.00	6.29	5.75	5.33	5.00	4.73	4.50	4.31	4.14
	2.50	10.00	8.50	7.50	6.79	6.25	5.83	5.50	5.23	5.00	4.81	4.64
20.00	3.00	10.50	9.00	8.00	7.29	6.75	6.33	6.00	5.73	5.50	5.31	5.14
	3.50	11.00	9.50	8.50	7.79	7.25	6.83	6.50	6.23	6.00	5.81	5.64
	4.00	11.50	10.00	9.00	8.29	7.75	7.33	7.00	6.73	6.50	6.31	6.14
	1.50	11.50	9.50	8.17	7.21	6.50	5.94	5.50	5.14	4.83	4.58	4.36
	2.00	12.00	10.00	8.67	7.71	7.00	6.44	6.00	5.64	5.33	5.08	4.86
25.00	2.50	12.50	10.50	9.17	8.21	7.50	6.94	6.50	6.14	5.83	5.58	5.36
	3.00	13.00	11.00	9.67	8.71	8.00	7.44	7.00	6.64	6.33	6.08	5.86
	3.50	13.50	11.50	10.17	9.21	8.50	7.94	7.50	7.14	6.83	6.58	6.36
	4.00	14.00	12.00	10.67	9.71	9.00	8.44	8.00	7.64	7.33	7.08	6.86
	1.50	14.00	11.50	9.83	8.64	7.75	7.06	6.50	6.05	5.67	5.35	5.07
30.00	2.00	14.50	12.00	10.33	9.14	8.25	7.56	7.00	6.55	6.17	5.85	5.57
	2.50	15.00	12.50	10.83	9.64	8.75	8.06	7.50	7.05	6.67	6.35	6.07
	3.00	15.50	13.00	11.33	10.14	9.25	8.56	8.00	7.55	7.17	6.85	6.57
	3.50	16.00	13.50	11.83	10.64	9.75	9.06	8.50	8.05	7.67	7.35	7.07
	4.00	16.50	14.00	12.33	11.14	10.25	9.56	9.00	8.55	8.17	7.85	7.57
35.00	1.50	16.50	13.50	11.50	10.07	9.00	8.17	7.50	6.95	6.50	6.12	5.79
	2.00	17.00	14.00	12.00	10.57	9.50	8.67	8.00	7.45	7.00	6.62	6.29
	2.50	17.50	14.50	12.50	11.07	10.00	9.17	8.50	7.95	7.50	7.12	6.79
	3.00	18.00	15.00	13.00	11.57	10.50	9.67	9.00	8.45	8.00	7.62	7.29
	3.50	18.50	15.50	13.50	12.07	11.00	10.17	9.50	8.95	8.50	8.12	7.79
40.00	4.00	19.00	16.00	14.00	12.57	11.50	10.67	10.00	9.45	9.00	8.62	8.29
	1.50	19.00	15.50	13.17	11.50	10.25	9.28	8.50	7.86	7.33	6.88	6.50
	2.00	19.50	16.00	13.67	12.00	10.75	9.78	9.00	8.36	7.83	7.38	7.00
	2.50	20.00	16.50	14.17	12.50	11.25	10.28	9.50	8.86	8.33	7.88	7.50
	3.00	20.50	17.00	14.67	13.00	11.75	10.78	10.00	9.36	8.83	8.38	8.00
40.00	3.50	21.00	17.50	15.17	13.50	12.25	11.28	10.50	9.86	9.33	8.88	8.50
	4.00	21.50	18.00	15.67	14.00	12.75	11.78	11.00	10.36	9.83	9.38	9.00
	1.50	21.50	17.50	14.83	12.93	11.50	10.39	9.50	8.77	8.17	7.65	7.21
	2.00	22.00	18.00	15.33	13.43	12.00	10.89	10.00	9.27	8.67	8.15	7.71
	2.50	22.50	18.50	15.83	13.93	12.50	11.39	10.50	9.77	9.17	8.65	8.21
40.00	3.00	23.00	19.00	16.33	14.43	13.00	11.89	11.00	10.27	9.67	9.15	8.71
	3.50	23.50	19.50	16.83	14.93	13.50	12.39	11.50	10.77	10.17	9.65	9.21
	4.00	24.00	20.00	17.33	15.43	14.00	12.89	12.00	11.27	10.67	10.15	9.71

\$2 to \$6 per ton along with a donation of his own time.

The largest item of expense charged against the crop is interest on investment, ranging from \$14.55 per acre on Farm B to \$25 per acre on Farm D. In other words, when the crop started to grow in the spring it had an interest charge against it of better than \$4 per ton.

Being so far removed from market it is not likely that the land, even with a change in the cropping system and with live stock introduced, could show any profit over such a handicap placed on it by too high a valuation.

If one assumes that soil conditions are similar and that the water charges per acre-foot are the same for the four farms, the data submitted indicate also that on Farms A, B, and D excessive amounts of water were used. The water charge per acre on these farms was \$4.35, \$3.15, and \$4.30, respectively, or an average cost per ton of 85 cents, whereas on Farm C the water charge per acre was \$2.70, or only 50 cents per ton.

Another thing of interest in the data is to note how the production costs per ton decrease as the yields increase on those farms where like costs are the same or nearly so. This is very well illustrated by comparing the yields and cost per ton on Farm A with Farm D and also Farm B with Farm C. The difference in yield per acre between Farm A and Farm B is 0.9 of a ton, making a difference in the production cost per ton of \$2.58. Some of this difference here, however, may be partly accounted for by the low harvesting cost per ton on Farm D, though the low harvesting cost is offset somewhat by Farm D's higher fixed charges. But by making the fixed charges and the harvesting costs per ton the same on the two farms there is still a difference due to yield of more than a dollar per ton in the production costs. The same thing can be said in comparing Farm B with Farm C.

Further illustrating the decrease in cost of production as the yields are increased, Table 3 has been prepared showing the cost of alfalfa per ton in the stack when different rates of growing costs and harvesting costs are used.

Table 3 points out in a most convincing way the importance of large yields in reducing costs and should be of special interest to farmers at this time, who are so vitally interested in keeping costs down to the minimum. The yields on many farms could be increased by a more careful preparation of the land before planting—leveling down the high places, thus permitting a better distribution of the irrigation water. Time of cutting and keeping the crop at all stages in a good growing condition are also factors which influence yield.

The use of Table 3 in determining the production cost per ton of alfalfa on any farm where the grow-

ing costs, harvesting costs, and yield are known can be illustrated by taking these cost items for any of the farms in Table 2. Take for example Farm A. The fixed growing costs per acre are \$34.65, the harvesting costs per ton are \$3.75, and the yield is 4.8 tons. Now run down the column under fixed growing costs per acre to the amount corresponding nearest to \$34.65, which is \$35; then in the column under harvesting cost per ton find the amount corresponding nearest with \$3.75 or \$4. Now move over under cost per ton at various yields to the column having at its head the yield which corresponds nearest Farm A's yield of 4.8 tons, which is 5, and in this column opposite the amount \$4 you will find the amount of \$11, or Farm A's cost per ton for producing alfalfa. By referring back to Table 2, where the production cost per ton for Farm A has been worked out in detail, it will be seen that the production cost given there is \$10.97 per ton, a difference of 3 cents.

It is hoped that from the discussion in the preceding paragraphs no one will infer that the growing of alfalfa hay to be sold on the commercial market is approved by the writer. It is very seldom, if ever, that such a practice proves profitable, a fact well known to those who have followed it for any length of time. The profitable disposal and utilization of their crops is one of the most serious problems confronting farmers. Especially is this true of farmers on reclamation projects who are far removed from the large consuming centers. To emphasize more fully the need of giving more attention to the disposal and utilization of farm crops, it may be worth while to compare the returns per acre from alfalfa where sold from the farm with the returns where it is disposed of on the farm through dairy cattle. Taking a yield of 4 tons per acre, which is not an exceptional yield on many projects, and allowing the market price of \$9 per ton for alfalfa, the gross returns would be \$36 per acre. From information collected by Mr. Cline on the Newlands project, a return of 1,500 pounds of skim milk and 50 pounds of butter fat from a ton of alfalfa hay is not unreasonable. At the market price for these products of 25 cents a hundred for skim milk and 30 cents a pound for butter fat the returns from an acre, or the 4 tons of hay, when fed to dairy cattle, would be \$75, or \$18.75 per ton for alfalfa as compared with \$9 per ton when sold on the commercial market. It is true there would be a little more work connected with it, but the calves and the fertilizer from the dairy herd would more than offset the extra work. It should not take much figuring or thinking either to demonstrate that the most profitable way to dispose of alfalfa is on the farm through some branch of the live-stock industry.—A. C. Cooley, *Agriculturist in Charge, Office of Demonstrations on Reclamation Projects.*

REPORT ON COST OF DRAINAGE CONSTRUCTION, NEWLANDS PROJECT.

THE accompanying tables show the cost of drainage construction on the Newlands project to March 1, 1922. Table 1 shows the *total cost* of each drain as constructed March 1, 1922. This cost includes excavation, structures, and overhead expense. Table 2 shows the field cost of excavation and the total yardage moved on each drain.

TABLE 1.—*Total cost of drains as constructed Mar. 1, 1922.*

Drain.	Total cost Mar. 1, 1922.	Linear feet constructed.	Cost per linear foot.
Carson Lake.....	\$7,392.56	13,380	\$0.55
L. drain and branches.....	47,594.33	58,145	.82
New River.....	38,450.08	38,295	1.00
Harmon.....	3,240.54	4,210	.78
Kent Lake.....	11,127.41	5,290	2.10
Lower Soda Lake.....	22,252.49	15,647	1.42
New Fernley.....	2,447.25	1,720	1.42
Total.....	132,504.66	136,687 (25.88 miles.)	2.969

¹ Exclusive of \$17,428.97 for drainage investigations.

² Average cost per foot.

TABLE 2.—*Yardage and field cost of excavation.*

Drain.	Cubic yards excavation.	Total cost, excavation.	Unit cost per cubic yard.
Carson Lake.....	53,617	\$5,555.28	\$0.104
L. and branches.....	298,079	31,038.12	.104
New River.....	305,514	27,449.93	.090
Harmon.....	20,371	2,394.60	.117
Kent Lake.....	53,066	8,499.12	.160
Lower Soda Lake.....	113,759	13,602.84	.120
New Fernley.....	12,896	1,732.81	.135
Total.....	857,302	90,272.70	1.1053

¹ Average field cost.

These prices include leveling spoil banks, moving to work, depreciation of machine, labor, supplies, oil, gas, etc., caring for telephone wires, etc.

The rate of depreciation is a fixed amount per shift depending on the class of machine. This rate is used on all machines in the Reclamation Service and has been found by experience to be ample to care for the wear and tear on a machine. The price for the Class 14 Bucyrus machines is \$35 per shift, and for the 1-yard Monighan and P. & H. machines \$15 per shift.

The estimate and plan accompanying the drainage contract provided for the following drains:

Class 1 drains,	81.20 miles at \$6,728-----	\$546,333
Class 2 drains,	19.95 miles at \$6,982-----	139,295
Class 3 drains,	16.65 miles at \$8,940-----	148,863
	117.80	824,491

This gives an estimated average cost of \$7,000 per mile.

The contract with the irrigation district authorizing this work provides for an expenditure of \$700,000. On March 1, 1922, a total of \$149,933.63 had been spent on drainage work. Of this total \$17,428.97 had been spent on drainage investigations, mostly before starting construction work. By subtracting the amount of money spent up to March 1, 1922, from the \$700,000 to be spent under the contract a balance of \$550,066.37 is found.

Reference to Table 1 shows that 25.88 miles of drain had been built up to March 1, 1922, at an average cost of \$0.969 per foot, or approximately \$5,116 per mile.

Every effort is being made to keep the costs down to a minimum and at the same time do effective, satisfactory work. If the balance of the drains can be built as cheaply as those already constructed, about 100 miles additional can be built. This added to the mileage already constructed would make a grand total of about 125.88 miles, which is more than the \$700,000 provided under the contract ever contemplated. This means that about 26 per cent more drains may be built than contemplated by the original estimate and about 8 miles more drain than were provided under Class 1, 2, and 3 drains described in drainage report dated April 22, 1919.—A. W. Walker, engineer, Newlands project.

Progress Report on Use of Aluminum Sulphate on hard soils, Newlands Project.

On March 4, 1922, plats Y3, Y4, and Y6 had been plowed and releveled in preparation for treatments with alum ore, 20 tons of which had been hauled from the mine. The material is screened, then the larger stuff broken up small enough not to interfere with the use of a manure spreader in spreading it. Plot Y3 has received an application of alum ore at the rate of 20 tons per acre. As the ore averages 21 per cent crystallized aluminum sulphate this would make 4.2 per cent of the pure sulphate to the acre. Plot Y4 is receiving the same amount of alum, but with a different treatment. Plot Y3 will be plowed under, but Y4 will not.

As fast as the ore arrives at the station it is screened and further application made to plots Y1 and Y2. These two plots will receive double the amount of alum applied to Y3 and Y4, or 40 tons of the ore per acre.

RECLAMATION LAW NOTES.

Relief to Water Users on Federal Irrigation Projects.

We print below Reclamation Service Circular Letter No. 1100, dated April 3, 1922, which contains the relief act of March 31, 1922, and the regulations thereunder approved by the Secretary of the Interior:

DEPARTMENT OF THE INTERIOR.

UNITED STATES RECLAMATION SERVICE.

WASHINGTON, D. C., April 3, 1922.

Acting Director to all field officers.

Subject: Regulations under the relief act of March 31, 1922, (Public No. 185, 42 Stat., —).

1. The following is the complete text of the above-named act:

An act to authorize the Secretary of the Interior to extend the time for payment of charges due on reclamation projects, and for other purposes.

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That where an individual water user or individual applicant for a water right under a Federal irrigation project constructed under the Act of June 17, 1902 (Thirty-second Statutes, page 388), or any Act amendatory thereof or supplementary thereto, is unable to pay any construction charge due and payable in the year 1922 or prior thereto, the Secretary of the Interior is hereby authorized, in his discretion, to extend the date of payment of any such charge for a period not to exceed one year from December 31, 1922: *Provided,* That the applicant for the extension shall first show to the satisfaction of the Secretary of the Interior by a detailed verified statement of his assets and liabilities, an actual inability to make payment at the time the application is made and an apparent ability to meet the deferred charge when the extension expires; also in cases where water for irrigation is available, that the applicant is a landowner or entryman whose land against which the charge has accrued is being actually cultivated: *Provided further,* That similar relief in whole or in part may be extended by the Secretary of the Interior to a legally organized group of water users of a project, upon presentation of a sufficient number of individual showings made in accordance with the foregoing proviso to satisfy the Secretary of the Interior that such extension is necessary: *And provided further,* That each charge so extended shall draw interest at the rate of 6 per centum per annum from its due date in lieu of any penalty that may now be provided by law, but in case such charge is not paid at the end of such extension period, any penalty that would have been applicable save for such extension, shall attach from the date the charge was originally due the same as if no extension had been granted.

"SEC. 2. That the Secretary of the Interior is hereby authorized, in his discretion, after due investigation, to furnish irrigation water on Federal irrigation projects during the irrigation season of 1922 to landowners or entrymen who are in arrears for more than one calendar year in the payment of any operation and

maintenance or construction charges, notwithstanding the provisions of section 6 of the Act of August 13, 1914 (Thirty-eighth Statutes, page 686): *Provided,* That nothing in this section shall be construed to relieve any beneficiary hereunder from payments due or penalties thereon required by said Act: *Provided further,* That the relief provided by this section shall be extended only to a landowner or entryman whose land against which the charges have accrued is actually being cultivated."

SCOPE OF THE ACT.

2. This act applies to all Federal irrigation projects constructed or being constructed under the reclamation law, including the Mesa division of the Yuma project in Arizona, but it does not apply to projects being constructed by the Reclamation Service for the Bureau of Indian Affairs. It is a temporary measure necessitated by the present financial stringency and the low price of agricultural products, and permits two classes of relief, to wit: (a) Extension of time of payment of construction charges due in 1922 or prior thereto, for not to exceed one year from December 31, 1922, and (b) the furnishing of irrigation water during the season of 1922 notwithstanding a delinquency of more than one year in the payment of any operation and maintenance or construction charges.

GENERAL POLICY.

3. The continuance of the present Federal reclamation plan is dependent upon the collection of water charges under the liberal terms of the reclamation law. Good policy and good faith both require that so far as possible repayments to the Government be not unreasonably postponed. Those water users who have credits and assets making it possible for them to pay all or part of their obligations due the United States will be expected to do so. At the same time, this measure will be applied sympathetically for the benefit of those not now able to pay, but who are exerting themselves to reclaim their lands and to carry out their contracts with the United States, and who, with the relief authorized by the measure, may be expected to become successful farmers. The measure does not contemplate the indiscriminate granting of relief, but care will be used to treat fairly all deserving cases. The question of leniency will be considered from a practical business standpoint and for the best interests both of the Government and of the water users.

RELIEF UNDER SECTION 1.

4. Under this section the Secretary is authorized, in his discretion, and under certain conditions and limitations as set forth below, to extend the date, or dates, of payment of construction charges due in 1922 or prior years. No such charge can be extended beyond December 31, 1923, and all such charges extended will draw interest at the rate of 6 per centum per annum from the time they originally become due and payable. If unpaid at the end of the extension period, any and all penalties as provided by the reclamation law will attach from the original due date. Operation and maintenance charges can not be extended, nor can penalties thereon be remitted or reduced.

RELIEF UNDER SECTION 2.

5. Section 6 of the act of August 13, 1914 (38 Stat., 686), provides that no water shall be delivered to the lands of any water-right applicant or entryman who shall be in arrears for more than one calendar year in the payment of any reclamation charges, and the effect of section 2 of the present act is to authorize the Secretary, in his discretion, to waive such inhibition for the year 1922. In other words, during the season of 1922, the Secretary is authorized, in his discretion, to furnish water to those in arrears for more than one calendar year as defined by departmental decision of May 24, 1916, C. L. 564. No extension of time in payment is provided for under this section, and the penalties for nonpayment, as recited in the reclamation law, continue to run until the sum or sums due are paid.

WHO ARE QUALIFIED TO APPLY FOR RELIEF.

6. The liberal terms of the reclamation law are intended to provide homes for persons who live by farming, and only those whose lands, against which the charges have accrued, are actually being cultivated are eligible for relief. This, however, does not mean that every irrigable acre of each farm must be cultivated, but that in a general way the farm must be under cultivation. No relief will be granted to non-residents and as to lands held in tenancy. An exception to the rule as to cultivation is made in the case of lands in Part I of the Mesa division of the Yuma project in Arizona, for which water is not yet available; the construction charges against these lands may be extended but not the purchase price for the lands. A further exception to the rules as to residence and cultivation may also be proper where serious illness or death in a family, or some other exigency, has compelled some relaxing of effort on the part of the owner. Each application which relies upon such a claim should be carefully and personally investigated by the project manager and full report made thereon. In some such cases it may be preferable for the owner to arrange to sell his land, in which case the Reclamation Service, upon request, will assist him to sell at a stipulated and reasonable price. The requirements of this paragraph apply to both classes of relief under the act.

WHO ARE ENTITLED TO RELIEF.

7. The Secretary is authorized to extend construction charges only upon a satisfactory showing by the applicant that he is actually unable to make payment at the time the application is made and that there is a reasonable likelihood of his being able to make payment when the extensions expire. Both elements must be present in order to satisfy the requirements of the act. In other words, relief may be given to an applicant who shows he is unable now to pay a past-due construction charge, *only* in the event of his being able to establish a reasonable expectation of paying the charge at a later specified date. As a general rule extensions of construction charges should be arranged so that each separate charge will fall due on a different date, such dates not being restricted to December 1. This will make it easier for the water user to pay the charges when the extensions expire. However, efforts should be made in every reasonable way to reduce the number of construction charge installments extended in any individual case. The general

principles stated in this paragraph will be applied in determining whether an applicant under section 2 of the act is entitled to irrigation water in 1922.

HOLDERS OF EXCESS LANDS.

8. Every effort should be made to reduce excess holdings within projects.

SALE OF LAND THROUGH THE RECLAMATION SERVICE.

9. In furtherance of the suggestions made in paragraphs 6 and 8 as to the sale of lands, each project manager is authorized to make available the services of the Reclamation Service, and the owner may list the land he is willing to sell, stating the price and terms at which he is willing to dispose of it. The price and terms named will be given consideration in determining what action should be taken upon his application for relief. When the price and terms at which the land is offered for sale are reasonable, a formal instrument authorizing the project manager to sell, may be executed by the landowner. A form for this purpose will be provided upon requisition by the project manager.

PROCEDURE BY APPLICANT.

10. Every person who desires to obtain any of the benefits of this act must file an application with the project manager on the form (7-298a) provided for that purpose. This form has been prepared for the purpose of assisting the applicant to present essential facts upon which the Secretary may exercise the discretion demanded by the act. A full and frank answer to each question propounded should be made. The application may be supplemented by any additional showing, provided same is submitted in the form of an affidavit. This form may be used by land purchasers under Part I of the Mesa division of the Yuma project in Arizona, questions not applicable being modified or deleted. A supply of printed form of application will be provided upon requisition by the project manager.

PROCEDURE BY UNITED STATES.

11. Upon receipt of an application for relief under either section 1 or section 2 of the act, the project manager shall promptly compile in the form of a statement all information practically available to him bearing on the assets and liabilities of the applicant, the extent to which he has cultivated his farm, and his personal and actual ability or inability to pay the charges due, and also his probable ability to pay same at a later date. The statement should also show where the applicant is residing and what, if any, other business he may be conducting and with what success. Each application, with the statement of the project manager, will be submitted to the board of directors of the local water users' association, or irrigation district, for its investigation, consideration, and recommendation. Following action by such board, the application will be forwarded immediately to the director (with copy to the chief engineer) with recommendation of the project manager. In cases where the director fully approves the requests of the applicant, his decision shall be final; in all other cases the application shall be referred to the Secretary of the Interior for final decision.

RELIEF TO ORGANIZED GROUP OF WATER USERS.

12. Relief as to construction charges may be granted to a legally organized group of water users, such as an irrigation district or a water users' association. This provision is intended to apply only to those organizations which have contracts with the United States covering the group payment of water charges. The necessity for such relief must appear from individual showings made upon the regular application blank. However, a special application must first be made by the organized group of water users through the project manager, chief engineer, and director, and each such case will be handled by itself as differing circumstances warrant.

MORRIS BIEN,
Acting Director.

Approved April 3, 1922.

ALBERT B. FALL,
Secretary.

Government Not Liable for Damages to Horse on Yuma Project.

By contract dated May 5, 1920, the United States Reclamation Service leased a horse and harness from R. R. Vainoy for use on the Yuma Federal irrigation project in Arizona, at a monthly rental of \$15, the contract providing that the United States should exercise ordinary care in the use of the property. While the horse was being used with ordinary care, he became frightened at the odor, noise, and paraphernalia of a trapper who was passing by, and as a result ran away and was injured in a barbed-wire fence. The Comptroller General held in this case (Compt. Gen. Dec., Mar. 15, 1922) that the proximate cause of this damage was not the "operations of the United States," but circumstances entirely foreign to and in no way connected with such operations, and that therefore there was no liability on the part of the Government under the appropriation act of June 5, 1920 (41 Stat., 913), or independently thereof.

Patents to Disabled Soldier Entryman.

An Act To amend the Act of March 1, 1921 (Forty-first Statutes, page 1202), entitled "An Act to authorize certain homestead settlers or entrymen who entered the military or naval service of the United States during the war with Germany to make final proof of their entries." [Act April 7, 1922, Public No. 188, 42 Stat.—.]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled. That the Act approved March 1, 1921 (Forty-first Statutes, page 1202), be amended to read as follows: "That any bona fide settler, applicant, or entryman under the homestead laws of the United States, or any desert land entryman whose entry is subject to the provisions of the Act of June 17, 1902 (Thirty-second Statutes, page 388), who, after settlement, application, or entry, and prior to November 11, 1918, enlisted or was actually engaged in the United States Army, Navy, or Marine Corps during the war with Germany, who has been honorably discharged and because of physical incapacities due to the service is unable to return to the land, may make final proof, without further residence, improvement, cultivation, or reclamation, at such time and place as may be authorized by the Secretary of the Interior, and receive patent to the land by him so entered or settled upon,

subject to the provisions of the Act or Acts under which such settlement or entry was made: *Provided*, That no such patent shall issue prior to the conformation of the entry to a single farm unit, as required by the Act of August, 13, 1914 (Thirty-eighth Statutes, page 686): *And provided further*, That this Act shall not be construed to exempt or relieve such applicant or entryman from payment of any lawful fees, commissions, purchase moneys, water charges, or other sums due to the United States, or its successors in control of the reclamation project, in connection with such lands."

Bills Relating to Federal Reclamation.

IN THE HOUSE.

H. R. 11074.—"A bill to authorize Federal farm loans on lands under United States reclamation projects," introduced March 27, 1922, by Representative Carl Hayden, of Arizona.

IN THE SENATE.

S. 3324.—"A bill to provide for the further rehabilitation of disabled veterans of the World War who have received agricultural training through the Veterans' Bureau," introduced March 22, 1922, by Senator Ralph H. Cameron, of Arizona.

S. 3384.—"A bill authorizing an appropriation to meet proportionate expenses of providing a drainage system for Paiute Indian lands in the State of Nevada within the Newlands reclamation project of the Reclamation Service," introduced April 3, 1922, by Senator Key Pittman, of Nevada.

S. 3394.—"A bill to provide for the development of the lands within the Colorado River Indian Reservation for the benefit of the Indians and of veterans of the World War," introduced April 4, 1922, by Senator Ralph H. Cameron, of Arizona.

—Ottamar Hamelt.

Recent Reclamation Service Orders and Announcements.

CIRCULAR LETTERS.

No.

1089. Tenancy on United States Reclamation Service projects.
1090. Opening or leasing of public lands.
1091. Doubtful accounts.
1092. Form of application to be made by water users for relief in connection with delinquent water charges.
- 1092a. General Accounting Office—Change of address—Amending C. L. 1062 of December 19, 1921.
1093. *H. R. 9606*, A bill to authorize the Secretary of the Interior, in his discretion, to extend the time of payment of construction charges on reclamation projects, etc.
1094. Report requested regarding farm units entered subject to the reclamation act but for which water-right application has not been filed.

1095. New Form 7-341, Monthly progress report summary.
 1096. Economies, Newlands project.
 1097. Repayment collections and their postponement.
 1098. Tenancy acreage on United States Reclamation Service projects.
 1099. Preference right of entry to ex-service men un-

- der Public Resolution No. 36, approved January 21, 1922, amending Public Resolution No. 29 of February 14, 1920 (41 Stat. 414.) General Land Office circular No. 678, modified.
 1100. Regulations under the relief act of March 31, 1922, Public No. 185, 42 Stat.
 1101. Results of irrigation, 1921.

ANNUAL WATER CHARGES ON FEDERAL IRRIGATION PROJECTS, SEASONS OF 1921 AND 1922.

[Compiled by Frank J. Bergin, counsel, Washington office.]

Projects.	Minimum charge per acre.		Number of acre-feet delivered for minimum charge.		Acre-foot charge in flood season.		Acre-foot charge not in flood season.		Acre-foot charge at all times.		Charge for additional water per acre-foot.	
	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922
Belle Fourche.....	\$2.00	\$1.40			\$0.75	\$0.50	\$1.50	\$1.00				
Boise.....	1.50	1.25			.50	.45	.70	.65				
New York water-right land.....	.75	.65	1	1							\$0.70	\$0.65
Carlsbad.....	2.00	1.85	2	2							1.50	.75
Lands outside project (R).....									\$1.55	\$1.55		
Grand Valley (R).....	2.00	1.50	2	2							1.00	.75
Huntley.....	4.00	2.00			1.75	1.00	2.50	1.50				
King Hill (C).....												
Klamath (C).....												
Lower Yellowstone (C).....												
Milk River (R):												
Upper Valley—Private canals.....	.50	.50	1	1							.50	.50
Lower Valley—Land subject to reclamation law.....									2.00	2.00		
Lower Valley—Land not subject to reclamation law.....									5.00	5.00		
Minidoka.....	2.00	1.50			.60	.50	1.30	1.00			.80	.75
Newlands.....	1.65	2.00	1½	2½								1.10
North Dakota pumping (C).....	1.65	1.40	2	2							.80	.70
North Platte.....	1.70	1.70	2	2							1.00	1.00
Land not under public notice (R).....												
Okanogan (C).....	2.00	1.75	3	3							.25	.25
Orland.....												
Rio Grande (C).....												
Riverton.....												
Salt River.....												
Shoshone.....	1.75	1.10	1½	2							.50	.50
Strawberry Valley:												
Spanish Fork division.....	.90	.75	1								.90	.75
High line division.....	1.80	1.50	2								.90	.75
Power canal subdivision.....	2.50	2.20	2									
Sun River:												
Fort Shaw division.....	2.50	1.50	1½	1½							.50	.60
Greenfields division (R).....		1.25			.60		1.00	1.25				
Umatilla (C).....												
Umpahgre.....												
Yakima:												
Tieton division.....	2.00	2.00			1.00	.75	1.75	1.50			.75	.60
Sunnyside division.....	2.00	2.00	2	2½							2.00	1.00
Yuina.....	3.50	4.00	2									

R designates project or portion thereof under rental basis. All others under public notice.

C designates project under contract to pay actual cost of operation and maintenance and as to which the irrigation district or association provides for the individual assessment.

1 Last year the charge was 50 cents for the first acre-foot additional and 75 cents per acre-foot for further quantities.

2 Minimum charge will permit delivery of 4½ acre-feet per irrigable acre upon lands in the vicinity of Fernley, Hazen, Northam, and Soda Lake: 3 acre-feet per irrigable acre upon the remaining lands served from T Line Canal and certain other lands served by the D Line Canal in the vicinity of Old River; and 2½ acre-feet per irrigable acre upon the remaining lands of the project served by the V Line Canal.

3 First additional acre-foot, 10 cents; second additional acre-foot, 20 cents; third additional acre-foot, 40 cents; and fourth additional acre-foot, 80 cents.

4 25 cents per acre-foot for first additional acre-foot and 50 cents per acre-foot for further quantities.

5 Water for irrigation purposes is not yet available on the Riverton project.

6 The Salt River project is being operated by the Salt River Valley Water Users' Association.

7 Rental charge last year was on basis of \$105 per second-foot; this year's charge is \$100 per second-foot.

8 Minimum charge will permit delivery of not more than the following amounts per irrigable acre: To lands of Class (A), 2 acre-feet; to lands of Class (B), 2½ acre-feet; to lands of Class (C), 3 acre-feet. The division of the lands into the three classes named—that is, (A), (B), and (C)—is made by the Sunnyside Valley Irrigation District and a map showing such classification is on file in the office of the project manager and in the office of the irrigation district. For newly reclaimed lands no charge will be made for water actually needed in excess of the amount covered by a charge of \$2 per irrigable acre at the said rates. Storage water furnished lands outside the project limits will be \$1 per acre-foot.

9 Minimum charge of \$4 per irrigable acre will permit delivery of not to exceed 3½ acre-feet of water per acre on certain sandy areas shown on the list attached to the public notice issued for this project and not to exceed 2½ acre-feet of water per acre on the other lands of the project. In lieu of the rate above given, any water user may elect the following rate, namely, \$4.50 per irrigable acre, which charge will permit delivery of not to exceed 2½ acre-feet of water per acre with additional water at the rate of 25 cents per acre-foot.

ADMINISTRATIVE AND STATISTICAL PROGRESS REPORTS FOR MARCH, 1922.

Monthly conditions of principal Reclamation Service reservoirs for March, 1922.

[Elevation above sea level.]

State and project.	Reservoir.	Available capacity in acre-feet.	Elevation.		Storage in acre-feet.			Out-flow in acre-feet.	Elevation of water surface.		
			Spill-way crest. ¹	Lowest gate sill. ²	Beginning of month.	End of month.	Maximum.		Beginning of month.	End of month.	Maximum.
Arizona, Salt River	Roosevelt ³	1,305,000	2103	1903	799,107	963,970	963,970	-----	2089.06	2101.14	2101.14
California, Orland	East Park	51,000	1199.68	1111.68	40,010	48,590	48,850	1,796	1193.27	1198.35	1198.5
Idaho:											
Boise	Arrowrock	280,000	3211	2956	120,000	128,000	128,000	86,000	3144.2	3148.5	3148.5
	Deer Flat	177,000	2518	2488	95,800	137,500	139,600	-----	2508.3	2513.6	2513.9
Minidoka	Lake Wolcott	95,180	4245	4236	82,520	86,800	87,960	406,545	4243.91	4244.38	4244.38
	Jackson Lake	847,000	6769	6730	314,240	337,970	337,970	-----	6746.4	6747.5	6747.5
Montana:											
Milk River	Nelson	27,000	2214	2200	18,300	17,840	18,300	-----	2209.03	2208.83	2209.03
St. Mary storage	Sherburne	66,000	4788	4720	-----	-----	-----	-----	-----	-----	-----
Sun River	Willow Creek	16,700	4130	4085	8,378	8,831	8,831	-----	4120.3	4120.9	4120.9
Nebraska-Wyoming, North Platte:											
	Pathfinder	1,070,000	5852	5670	620,540	682,260	682,260	5,148	5827.16	5831.35	5831.35
	Lake Alice	11,400	4182	4139	4,528	3,968	4,528	-----	4171.4	4170.3	4171.4
	Lake Minatare	60,766	4125	4074	51,797	51,394	51,797	-----	4120.7	4120.5	4120.7
Nevada, Newlands:											
	Lake Tahoe	120,000	6230	6224	-----	-----	-----	21,366	6225.29	6225.28	6225.34
	Lahontan	290,000	4162	4060	199,850	214,500	214,500	7,186	4153.3	4155.4	4155.4
New Mexico:											
Carlsbad	McMillan	45,000	3267.7	3241.6	32,350	31,000	32,350	-----	3265.6	3265.2	3265.6
Rio Grande	Elephant Butte	2,638,860	4407	4231.5	1,810,673	1,771,247	1,810,673	65,644	4383.7	4382.45	4383.7
Oregon, Umatilla	Cold Springs	50,000	621.5	560	37,600	44,550	44,550	94	604.44	617.83	617.83
Oregon-California, Klamath	Clear Lake	402,000	4540	4514	336,000	352,000	352,000	-----	4035.13	4035.74	4035.74
South Dakota, Belle Fourche	Belle Fourche	203,000	2975	2920	110,750	125,750	125,750	-----	2961.5	2964	2964
Utah, Strawberry Valley	Strawberry	250,000	7558	7517	212,800	221,200	221,200	-----	7553.8	7554	7554
Washington:											
Okanogan	Conceonully	14,400	2290	2232	2,600	2,912	2,912	-----	2257.4	2258.7	2258.7
Yakima	Bumping Lake	34,000	3426	3380	3,060	2,280	3,060	-----	3393.8	3392.6	3393.8
	Lake Cle Elum	22,800	2134	2122	21,010	24,355	24,355	-----	2132.6	2134.1	2134.1
	Lake Kachess	210,000	2258	2192	183,410	187,845	187,845	-----	2249.3	2250.3	2250.3
	Lake Keechelus	152,000	2515	2425	110,990	115,880	115,880	-----	2497.2	2499.4	2499.4
Wyoming, Shoshone	Shoshone	456,600	5360	5132.3	399,151	399,760	399,760	12,895	5351	5351.1	5351.1

¹ Or maximum storage.

² Or zero storage.

³ Zero water depth at elevation 1902.2.

⁴ Amount of silt shown by silt survey deducted from original capacity.

⁵ Proposed regulation.

⁶ Estimated low-water limit under proposed plan of regulation.

⁷ For maintenance Truckee River power rates.

⁸ Elevation of reservoir raised 12 inches by stop logs in spillway.

SALT RIVER PROJECT, ARIZONA.

Operation and maintenance of irrigation system.—Water was run in all of the canals during March. The demand for irrigation water service increased steadily.

Three regular crews were in the field during the month. With a daily average of 68 man days and 14 stock days, the following maintenance work was accomplished: Miles main canals cleaned, 2½; miles laterals cleaned, 82¼; old structures repaired, 85; lineal feet stake and brush banks built, 1,621; cubic yards dirt fill placed, 625; cubic yards concrete placed, 183; cubic yards dry masonry placed, 4; miles canal roads dragged, 40.

In addition to the above maintenance work, the Ruth dredger, with a daily average of 4 man days and 5½ stock days, bermed 39,000 lineal feet of the Eastern Canal and 34,000 lineal feet of the east branch of the Consolidated Canal, making a total of 73,000 feet for the month.

The P. and H. dragline (½ yard) bermed 6,000 lineal feet of the Arizona Canal, in addition to removing sand from the canal (caused by 150 second-feet flood of Cave Creek March 18, 1922). This machine had an average of 2 man days for the month.

The following construction work was accomplished with a daily average of 34 man days and 6½ stock

days: Cubic yards dry masonry placed, 2; cubic yards concrete placed, 37½; lineal feet 18-inch concrete pipe placed, 116; lineal feet 24-inch concrete pipe placed, 774; lineal feet 24-inch corrugated pipe placed, 119; miles new irrigation ditch built, 6; cubic yards earth excavated, 198; sill and stringer bridges built, 12; turnouts and checks built, 30; cubic yards rock excavated, 325; lineal feet holes drilled and shot, 1,650.

Pump-house construction was continued during the month with an average of 6½ man days.

Work was continued on widening the Eastern Canal.

Operation of power system.—The total power generated during the month was 7,517,750 kilowatt hours. The Roosevelt plant operated continuously during the month, generating 4,362,000 kilowatt hours; the Cross Cut plant also operated continuously, with a total output of 1,976,900 kilowatt hours; the South Consolidated plant operated 97.8 per cent of the time, generating 558,100 kilowatt hours; the Arizona Falls plant operated 89 per cent, with an output of 244,900 kilowatt hours; and the Chandler plant operated 98 per cent, generating 375,850 kilowatt hours.

The substations all operated without trouble during the month, and the pumping plants were all available for service as required.

New drainage pumps.—To date the drilling of 21 new drainage wells west of Phoenix has been completed; 3 wells were completed during March.

Power lines for new pumping plants.—The construction of the transmission lines for the new pumping plants was completed. The substation structures were completed at nine of the plants.

Marinette substation.—Work on this installation was about 90 per cent completed.

Transmission line guying.—The guys on all towers between Goldfield and Tortilla Flats were in place at the end of the month; also between Roosevelt and Pine Creek.—*C. C. Cragin.*

MESA DIVISION, YUMA PROJECT, ARIZONA-CALIFORNIA.

At the lock joint pipe manufacturing plant, 9096 linear feet of pipe were cast, sizes ranging from 15 to 36 inches in diameter. Rock was also quarried and crushed for concrete aggregate.

The laying of pipe-line laterals and the construction of minor structures along the lateral system were carried on steadily.

At the B lift pumping plant all work was toward the final completion of features under this head in preparation for a plant efficiency test on the 10th, the result of which was satisfactory.—*Porter J. Preston.*

ORLAND PROJECT, CALIFORNIA.

Conditions during March were favorable for outside work and considerable farm development in the way of spring plowing, leveling, and seeding was in progress. A number of acreages varying from 5 to 70 acres were planted to vines and trees, several instances occurring where old alfalfa fields were being replaced by grapes and trees. Transfers of property, both improved and unimproved, were quite active, more so than for any month during the past year.

Storage at East Park Reservoir amounted to 48,590 acre-feet at the close of the month with the water level slightly above the permanent spillway crest. Unsettled weather conditions, together with the presence of a large amount of snow on the upper areas of Stony Creek watershed, made it advisable to defer placing the flash boards on the spillway until a later date. The East Park Feed Canal was in operation only 14 days of the month, delivering 4,400 acre-feet to the reservoir.

Marked progress was made in placing concrete lining. Notwithstanding a slight shortage of labor due to the opening of spring farm work, 22,059 square yards of lining were placed, which constitutes the largest amount of lining placed during any one month by one mixer force in the history of the project. Two and four-tenths miles of laterals were lined.

An average force consisting of eight men and eight head of stock practically completed the cleaning of canals and laterals, preparatory to the beginning of the irrigation season. A small amount of water was delivered during the latter portion of the month for irrigating recently planted orchards and vineyards and for testing leveled land.—*R. C. E. Weber.*

GRAND VALLEY PROJECT, COLORADO.

March weather conditions were not very favorable for outside work and most of the farmers were behind with their spring plowing and planting. The planting of early potatoes and spring wheat was in progress at the end of the month, and ground was also being prepared for sugar beets. An intensive canvass of the project was made by representatives of the Holly Sugar Co. to obtain the greatest possible beet acreage in order to insure the operation of the Grand Junction plant. A large number of farmers

were preparing to plant early potatoes, and it was evident that the acreage of this crop will be the largest in the history of the project. The price of alfalfa hay remained stationary at about \$7 per ton in the stack. Nearly all of last year's crop had been disposed of.

Maintenance work during the forepart of the month was concentrated on preparing the main canal for the running of water. On account of unfavorable weather conditions little work was accomplished in cleaning laterals and burning weeds. Water was turned into the main canal on the morning of March 20 and reached the lower end on the evening of the 22d. Deliveries were made for stock and domestic use to all farmers who cooperated in burning the weeds in the laterals, but no irrigation water was delivered during the month except to the Palisade Irrigation District. The P. and H. $\frac{1}{2}$ -yard dragline was operated one shift per day throughout the month on cleaning out and deepening Drain F-2 and the construction of a culvert under the Grand Valley Canal on Drain F. On the 25th this machine started to move to new work on project Drain H-2. Work was also started on overhauling one of the Monaghan machines, which was moved to new drainage work to be started in the vicinity of Loma. Field engineering consisted of miscellaneous drainage investigations and the location of a pipe line to supply the East Palisade Irrigation District from the pumping plant of the Orchard Mesa District.

The contract between the United States, the Grand Valley Water Users' Association, and the Orchard Mesa Irrigation District for the reconstruction of the latter's irrigation system was executed by the Acting Secretary of the Interior and returned to the project for the initiation of confirmation proceedings in the district court.

The Colorado River Commission, of which Herbert Hoover is chairman and on which each of the seven States in the basin is represented by one member, held a hearing in Grand Junction on March 29. Statements were made before the commission by a number of citizens of western Colorado in support of Colorado's contentions of its rights in the waters of the Colorado River.—*S. O. Harper.*

UNCOMPAHGRE PROJECT, COLORADO.

Cold weather prevailed during the early part of March, and as a result operation and maintenance and construction work was interfered with to a certain extent.

Work on the excavation and installation of structures on several small laterals which were taken over for operation by the service upon request by the water users was completed. The uncollected water rentals at the end of the month for the season 1921 amounted to approximately \$23,000. All project canals and laterals carried water for stock and domestic purposes. A small amount of water was also used for irrigation purposes to take care of the onion crop. Structure repairs at the Selig Canal headworks were completed, and the controlling works at this point are now in excellent condition for future irrigation seasons. The P. and H. dragline completed the excavation for the concrete drop below the Selig headworks weir and removed the washed in gravel from the main line of the Selig Canal below the headworks. The machine was then moved to the Montrose and Delta main line near mile post 12 and the canal was cleaned from that point to about milepost 9.5. In doing this cleaning work the machine also removed two old masonry culverts from under the main line, which dur-

ing the past year have been a constant menace to the safe operation of the canal. The removal of rock from the rock section of the Gunnison Tunnel and the patching of cracks in the concrete-lined section was completed. The protective riprap work along the Uncompahgre River to protect the project structures was also completed, and much work was accomplished in spading, repairs to small structures, and installation of additional turnouts and measuring devices on the project lateral system.

The project will be operated on a deferred water-rental plan for the season of 1922 similar to the plan in effect for the season of 1921, except that the water-rental rate has been reduced from \$105 to \$100 per second-foot. This plan provides for the deferment of one-half of the water-rental charges until July 1, with interest at 5 per cent from April 1 to July 1 and a 1 per cent per month penalty after July 1 until paid, and for the deferment of the second installment of water-rental charges to October 1, with interest at the rate of 5 per cent from April 1 to October 1 and a 1 per cent per month penalty after October 1 until paid. Water users who are at the present time delinquent for their water-rental charges for the season of 1921 are given preference in all cases where the need of additional employment arises, and such earnings are credited against their delinquent charges.—*L. J. Foster.*

BOISE PROJECT, IDAHO.

Farm work was delayed by cold weather during the first part of March and by heavy rains during the latter part. As a rule the greater part of the small grain is seeded in March; during this year, however, only about 20 per cent of the seeding was completed. Hay in some sections was sold at \$4 per ton. The contracts call for leaving the hay on the premises until next year. The purchases were apparently made in prediction of higher prices prevailing for the 1922 crop. The grass on the ranges was slow in starting, which caused the greater part of the range stock to be held in the feed lots. An unusually large acreage was being prepared for early potatoes and head lettuce.

Water supply.—Owing to cold weather the run-off during March was below normal. There was a large amount of snow in the mountains and the indications were that there will be a good water supply for the season.

Operation and maintenance.—Water was run through the Main Canal for filling Deer Flat Reservoir until the 22d, when it was turned out in order that the silt deposited above the Diversion Dam could be sluiced out and the lining on the Main Canal repaired. A number of small crews were employed in cleaning laterals, but owing to unfavorable weather the work was delayed. This work, however, was near completion by the end of the month.

Drainage.—Owing to frost conditions drainage work on the Greenleaf and Drew Drains was not resumed until March 1. The work was continued during the month. Progress was delayed on account of indurated material that was encountered.

Surveys.—Test borings were continued at Black Canyon diversion site on the Payette River. Progress was slow owing to the number of large boulders encountered. Minor surveys were made on the Arrow-rock Division in connection with farm laterals and replacement of structures.

Business in general.—There appeared to be some gain in trade. Dealers in seeds and poultry supplies especially reported business good.—*J. B. Bond.*

KING HILL PROJECT, IDAHO.

March weather was unfavorable for outside work.

Construction.—Construction forces were engaged in the completion of the several lock-joint pipe siphons preparatory to the beginning of the irrigation season. During the month Slick No. 2, Hammett, Little Alkali, Glenns Ferry, and King Hill siphons were completed with the exception of a few days' work jointing pipe and backfilling structures. The earth canal to replace the crooked flume was completed, as were repairs to Hafer and Hammett wood-stave pipe lines. During the spring construction season the following lock-joint pipe siphons have been completed:

	Inch.	Linear ft.
King Hill.....	27	1,312
King Hill.....	21	2,064
Hammett.....	24	4,024
Glenns Ferry.....	48	80
Little Alkali.....	48	176
Slick No. 1.....	54	256
Slick No. 2.....	54	304
Camas Road.....	54	212

Operation and maintenance.—A small maintenance force was employed 10 days cleaning laterals and repairing structures.

Crops.—Owing to the late season farming operations were confined to feeding stock. Hay stocks were depleted and the price advanced from \$4 to \$7.50 per ton in the stack. Sheep were being taken to the lower ranges.—*Walter Ward.*

MINIDOKA PROJECT, IDAHO.

Normal weather prevailed throughout most of March. Some farm work was begun, although the ground was still rather wet.

In the office at Burley investigations were continued of waters users who were more than one year in arrears in the payment of their water charges or were otherwise subject to cancellation of the entry or water right.

The power house was operated continuously. At the pumping stations two pumps at each station were ready to run at the end of the month; the remaining pumps will be made ready in a few days.

Twelve suits for the condemnation of right of way for reservoir or town-site property at American Falls were tried in the Federal court at Pocatello. The total damages awarded were \$13,872; the amount that had been offered by the Reclamation Service for the property was \$18,188.65.

Good progress was made toward the organization of a large reservoir district to be used for financing purposes. Meetings were held in numerous places in the Snake River Valley, and the sentiment expressed was practically unanimous in favor of the district.—*Barry Dibble.*

HUNTLEY PROJECT, MONTANA.

The general field and climatic conditions prevented extensive operations during March, although the weather was for the most part favorable to outside work. The frost, snow, and mud prevented resumption of field operations.

About ten thousand feet of lumber for replacing trap boxes, about one-third of which has been treated with creosote, was cut with a power saw operated by the White truck.—*A. R. McGinness.*

MILK RIVER PROJECT, MONTANA.

March weather was unfavorable for construction, maintenance, and farming operations. Although the river flow increased somewhat about the 20th, the ice did not go out. Most of the surplus hay was disposed of, although the price did not advance much.

The contractor for the erection of buildings at Dodson Dam made good progress and practically finished his contract. All other contracts were inactive and no construction was under way by Government forces. Call for proposals, to be opened April 17, was issued for 180,000 cubic yards of earthwork on the Glasgow Division; and preparation of schedules and specifications for structures involving about 20,000 cubic yards of excavation and backfill, 360 cubic yards of concrete, 9,000 feet b. m. lumber, placing 660 linear feet flume metal, and laying 3,700 linear feet of vitrified pipe was under way.

Operation and maintenance consisted of repair of two concrete siphons on Glasgow Division and inspection of gate operating machinery at Vandalia and Dodson Dams.—*Geo. E. Stratton.*

ST. MARY STORAGE.

Steady winter weather continued nearly the entire month of March. It was impossible to do any construction work other than freighting.

Two sections of pipe with an expansion joint, to be placed in St. Mary Crossing pressure pipe in place of two sections that were crushed owing to the pipes creeping, were received and started for the work.—*R. M. Snell.*

SUN RIVER PROJECT, MONTANA.

Preparations were made for active work as soon as the frost is out and conditions favorable. Materials were being collected and equipment was being put in shape for repairing Willow Creek discharge structure and for cleaning laterals. Field surveys of irrigable areas in Big Coulee Division were completed; some field surveying and considerable office work were done in connection with the construction of Part 2 of Greenfields Division. The project history was very nearly completed.

Baling hay and marketing produce were the principal farm activities; plowing, disking, and harrowing were started near the end of the month. Surplus hay on the project was practically all sold. Carload shipments from the project were as follows: From Fort Shaw, 47 cars of hay, 11 of wheat, 1 of potatoes; from Simms, 30 of hay, 3 of wheat, 1 of potatoes; from Fairfield, 19 of wheat, 1 of flax; total, 77 of hay, 33 of wheat, 1 of flax, 2 of potatoes.—*Geo. O. Sanford.*

LOWER YELLOWSTONE PROJECT, MONTANA-NORTH DAKOTA.

At the Thomas Point pumping plant excavation in connection with the foundation was completed and about one-third of the piles driven.

Maintenance work consisted of cutting brush and willows in the main canal and taking profiles in connection with drainage investigations.

On the upper end of the project the ice broke in the Yellowstone River on the 20th of the month. There were several small ice jams owing to the small amount of water in the river, but little damage was reported on account of floods.

Office engineering work was carried on in connection with the compiling of data for the annual project history and the computing of quantities of excavation,

concrete, reinforcing steel, and lumber for the various structures under contract 787. The necessary engineering work in connection with the construction of the Thomas Point pumping plant was also performed.—*L. H. Mitchell.*

NORTH PLATTE PROJECT, NEBRASKA-WYOMING.

Operation and maintenance, storage division.—Valve No. 1 in the south tunnel at Pathfinder was kept partly open for the delivery of about 100 second-feet for use of the city of Casper and the oil refineries until about the 20th of March. Since then some repairs are being made on the discharge conduits of the south tunnel. The requirements for the city of Casper and oil refineries were being supplied by the local run-off from the Casper Mountains and intervening watershed between Casper and Pathfinder since the closing of the south tunnel. Preparations were being made to repair a portion of the spillway made necessary by the results of the overflow during 1921.

Interstate Division.—Repairs were started on the canal bank of the Interstate Canal between miles 2 and 3; also at a point near Wyncote Camp. At this latter place about 200 feet of concrete lining was being started below the Wyncote Check. Ninety-five miles of lateral cleaning were surveyed and staked, and bids opened March 28. About one-third of this work was let by contract to the lowest bidders or by acceptance of subsequent bids which came within estimated costs. Repairs were being made on Flumes Nos. 1 and 3 of the Low Line Canal.

Fort Laramie Division.—The Fort Laramie Canal was operated from the headworks to the Lingle Power Plant. The principal work consisted of preparing the system for irrigation so far as it is now completed. Contracts were let for the cleaning of 9½ miles of laterals at prices ranging from 16 to 18 cents per cubic yard.

Live stock and crops.—It is estimated that about 8,000 head of sheep and 800 head of cattle were shipped to the market during the month. Approximately 4,000 head of sheep and 1,500 head of cattle will be shipped later. Prices continued good, and shippers were making good profits, especially on sheep. About 1,500 head of cattle were being fed, partly from beet pulp, near the local sugar factory for the June market.

The revival of live-stock prices aided materially in disposing of forage. It was estimated that practically all of the hay will be disposed of. Alfalfa hay was selling for \$7 per ton in the stack.

Drainage.—Work continued on the Katzer Drain in a satisfactory manner. About 3 miles of the main drain and 4½ miles of Branch A of this drain have been completed. Several crossing structures were being built on this drain during the month, the principal one being a siphon for the French Ditch.

Construction.—Two electric draglines continued excavation on the Fort Laramie Canal in a most satisfactory manner. These machines were approaching the crossing of Owl Creek about 11 miles southwest of Mitchell. One electric dragline was moved to Lyman, Nebr., loaded on cars, and completed ready for shipment to the Shoshone Project on March 11.

On the Second Lateral District the building of miscellaneous structures on the distribution system began with the opening of spring weather. About the middle of March the Government forces were rapidly increased and additional contracts were let so as to finish the system ready for operation on or about May

Crop report, irrigated farms, Lower Yellowstone project, Montana-North Dakota, 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	7,401	Ton.....	13,338	1.8	\$6.50	\$86,695	\$11.71
Barley.....	325	Bushel.....	4,925	15.1	.40	1,970	6.06
Beans.....	30	do.....	420	13.8	2.50	1,050	34.43
Beets, sugar.....	1,533	Ton.....	12,784	8.3	5.85	74,786	48.78
Beets, tops for feed.....	1,533	Acre.....			3.00	4,599	3.00
Beets, for feed.....	26	do.....			6.00	156	6.00
Cane.....	25	Ton.....	57	2.2	4.00	228	8.98
Corn.....	490	Bushel.....	15,199	31.0	.55	8,360	17.06
Corn, ensilage.....	31	Ton.....	242	8.0	5.00	1,210	39.03
Corn, fodder.....	64	do.....	196	3.0	4.00	784	12.00
Clover, sweet, hay.....	32	do.....	64	2.0	4.00	256	8.00
Clover, sweet, seed.....	56	Bushel.....	56	1.0	2.50	140	2.50
Flax.....	77	do.....	572	7.4	1.50	858	11.14
Garden.....	188	Acre.....				13,463	71.40
Hay.....	2,280	Ton.....	1,532	.7	4.00	6,128	2.70
Oats.....	1,513	Bushel.....	35,255	23.3	.40	14,102	9.38
Pasture.....	477	Acre.....				3,115	6.53
Potatoes.....	314	Bushel.....	40,732	129.5	.60	24,440	77.69
Wheat.....	5,100	do.....	58,318	11.4	1.00	58,320	11.44
Miscellaneous ¹	18	Acre.....				3,560	189.87
Less duplicated areas.....	1,533						
Total cropped.....	19,980	Total and average.....				304,220	15.23
		Areas.....			Acres.....	Number of farms.....	Per cent of project irrigable.....
		Total irrigable area farms reported.....			² 38,760	572	100.0
		Total irrigated area farms reported.....			19,980		51.5
		Area dry farmed.....			9,680		25.0
		Area not farmed.....			9,103		23.5
Total irrigated—project.....	19,980	Total cropped area in grain crops damaged by hail.....			4,776		12.3

¹ Fruit, onions, cabbage, and melons.² Includes town sites Crane, Sidney, and Fairview.*Crop report, dry farmed units, Lower Yellowstone project, Montana-North Dakota, 1921.*

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average (per acre).	Per unit of yield.	Total.	Per acre.
Alfalfa.....	801	Ton.....	1, 013	1. 3	\$6. 50	\$6, 587	\$8. 22
Alfalfa seed.....	100	Bushel.....	56	. 6	9. 00	506	5. 06
Barley.....	274	do.....	4, 865	17. 7	. 40	1, 946	7. 10
Beans.....	28	do.....			2. 50		
Beets, sugar.....	43	Ton.....	60	1. 4	5. 85	350	8. 16
Beets for feed.....	22	Acre.....				71	3. 30
Clover, sweet, hay.....	59	Ton.....	54	. 9	4. 00	216	3. 66
Clover, sweet, seed.....	122	Bushel.....	310	2. 5	2. 50	766	6. 28
Corn.....	365	do.....	7, 933	21. 8	. 55	4, 363	11. 97
Corn, ensilage.....	27	Ton.....	93	3. 4	5. 00	465	17. 22
Corn, fodder.....	150	do.....	497	3. 3	4. 00	1, 988	13. 25
Flax.....	448	Bushel.....	2, 720	6. 0	1. 50	4, 080	9. 11
Garden.....	14	Acre.....				1, 885	134. 64
Hay.....	1, 030	Ton.....	740	. 7	4. 00	2, 962	2. 88
Oats.....	1, 085	Bushel.....	20, 085	18. 5	. 40	8, 034	7. 41
Pasture.....	1, 302	Acre.....				5, 763	4. 43
Potatoes.....	62	Bushel.....	6, 730	108. 4	. 60	4, 038	65. 13
Wheat.....	3, 684	do.....	36, 580	10. 0	1. 00	36, 580	10. 00
Crops lost account river flood in June.....	95						
Total cropped (dry farmed).....	9, 680	Total and average.....				80, 600	8. 33
		Areas.....				Acres.....	Per cent of project irrigable.....
Total farmed.....	9, 680	Total dry area farmed on irrigable land.....				9, 680	25

1. This covers the territory opened for settlement and entry September 9, 1921.

Northport Division.—Excellent progress was made on the second big cut east of the Burlington Railroad between Stations 671 and 686. A small force of 7 men continued building miscellaneous concrete structures on the main canal and laterals. In addition about a half dozen small earthenware constructing outfits continued excavation of laterals and one contractor was building siphons on Bratten and Dugout Creeks.

Power system.—The Lingle Power Plant operated continuously, the total output for the month being 191,410 kilowatt hours of which amount there were delivered to the city of Torrington 29,200; Lingle, 4,790; Morrill, 8,700; and Mitchell, 26,000 kilowatt hours. About 22 per cent of the power was lost in transmission.

Surveys.—One field party was engaged in location of structures and making irrigable area surveys on the Fort Laramie Division; also in the revision of a portion of the Fort Laramie Main Canal, and a study of the alternative locations of Tunnel No. 3. On the Northport Division the field party continued on irrigable area surveys and furnishing lines and grades for contractors and the dragline excavators.—*Andrew Weiss.*

NEWLANDS PROJECT, NEVADA.

March weather interfered with maintenance work. The Truckee Canal was operated intermittently to facilitate the installation of a new timber-steel check structure at Station 1060 and a new turnout at Station 1002. Lahontan power plant was operated from the reservoir until the 27th.

A small amount of water was run in the T Line Canal for priming purposes.

Most of the lateral cleaning work being done under contracts was completed at the end of the month, several schedules remaining undone. Extensions of time on practically all of these contracts were necessary owing to unusual spring weather conditions.

The banks of the Pb Lateral, T system, were raised over a length of $\frac{1}{2}$ mile. Similar work was done on the Bu Lateral ($\frac{1}{4}$ mile) V system and K2b Lateral ($\frac{1}{4}$ mile) in the Truckee system. Other maintenance work consisted of cleaning 40 miles of laterals in the various systems and the placing of a large amount of brush riprap in canals and laterals.

Excellent progress was made on drainage construction work, about 188,570 cubic yards of material being excavated with six draglines in operation on the Fernley, Kent Lake, Harmon, Lower Soda Lake, Carson Lake, and L Drains. About 74,200 board feet of lumber were used for the placing of drain structures during the month.

Numerous minor timber structures were installed by maintenance and construction forces in the lateral system.

The Up Lateral was extended about 0.53 mile in the T system by Government forces.

Contract work on the C1A and Hodgen Laterals, V system, was completed, a total of 2,796 cubic yards of material being moved.

On March 27 bids were opened for the sale of Government mules and equipment; 19 mules, numerous wagons, scrapers, and other items of equipment were sold at good prices.

Surveys were in progress during the month for determination of areas being irrigated in excess of water-right contract areas.—*D. S. Struver.*

CARLSBAD PROJECT, NEW MEXICO.

Water was in the canals during the entire month of March and about 7,000 acres were irrigated. Water was used before plowing for summer crops and for the irrigation of alfalfa and a minor acreage of small grains. Approximately 3,000 acre-feet of water were used at the farms. Maintenance work consisted of building several drops and riprapping lateral banks at road crossings. Several small turnouts were constructed.

The weather was fair and warm, with several high winds. The total discharge of the Pecos River at the Dayton station amounted to 5,700 acre-feet. The storage steadily declined during the month. Water originating from return flow below Lake McMillan was sufficient for project demands.

Plowing on the farms for the new crop year was practically completed at the close of the month. The fattening and pasturing of about 10,000 head of sheep and cattle was still in progress. The mill at Loving crushed 620 tons of cotton seed during the month, which produced $3\frac{1}{2}$ carloads of oil, 280 tons of cake and meal, 107 tons of hulls, and 137 bales of linters. The entire output has been sold. The project collections during the month amounted to \$16,175.93.—*L. E. Foster.*

Prevailing crop prices at close of March, 1922.

Project.	Alfalfa hay, per ton.		Barley, per bushel.	Oats, per bushel.	Wheat, per bushel.	Potatoes, per bushel.
	In stack.	Baled at ship- ping point.				
Salt River.....	\$12.14	\$16.20	\$0.75	\$0.50	\$1.47	.....
Orland.....	10.00	14.50	.63	.....	1.05	.....
Grand Valley.....	7.00	10.00	.....	.45	1.00	\$0.75
Uncompahgre.....	6.50	.....	.63	.33	.96	.39
Boise.....	4.00	8.00	.45	.50	.90	.90
King Hill.....	7.50	9.00	.....	.....	.....	.....
Minidoka.....	4.00	7.25	.60	.42	.93	.48
Huntley.....	15-20	20.00	.....	.....	.....	.....
Milk River.....	8-10	.....	.40	.40	1.25	.90
Sun River.....	8.00	12.00	.70	.80	1.22	1.00
Lower Yellowstone.....	15-20	.....	.55	.50	1.31	1.00
North Platte.....	7.00	.....	.35	.30	.80	.70
Newlands.....	7.00	11.00	.90	.75	1.42	1.20
Carlsbad.....	.....	14-16	.....	.....	.....	.....
Rio Grande.....	.....	16-22	.....	.65	1.80	.....
North Dakota pumping.....	15.00	.....	.38	.50	1.27	1.00
Umatilla.....	12.00	16.00	.....	.....	.....	.....
Klamath.....	4-6	12.00	.60	.40	1.05	.....
Belle Fourche.....	10.00	14.00	.53	.40	1.15	1.40
Strawberry Valley.....	8-9	11-12	.70	.50	1.05	.48
Okanogan.....	12.00	.....	.....	.....	.....	1.20
Yakima.....	.....	16.00	.....	.....	.....	.59
Riverton.....	4.00	.....	.....	.40	1.07	.90
Shoshone.....	10.00	13.00	.....	.42	1.07	.70
Indian projects:	.....	.....	.....	.....	.....	.....
Blackfoot.....	15.00	.....	.72	.56	1.21	.....
Flathead.....	15.00	17.50	.....	.62	.69	.90
Fort Peck.....	.....	.....	.....	.....	1.26	1.00

RIO GRANDE PROJECT, NEW MEXICO-TEXAS.

The completion of the backfill against the spillway channel at Elephant Butte Dam brought to a close the recent construction work on the storage division.

In the Leasburg and Mesilla Divisions, combined, two Bucyrus 9 $\frac{1}{2}$ excavators and a Monighan 2-T excavator continued on drainage construction, with two small P. and H. excavators accomplishing some work

on two spur drains. In all, 1.9 miles of drain were constructed with the removal of 97,600 cubic yards. A Ruth ditching machine progressed on lateral reconstruction, removing 6,400 cubic yards from 3 miles of lateral. Two P. and H. machines also worked on laterals.

In the El Paso Division drainage construction progressed with the operation of Bucyrus 9½ excavator and one contract machine, 31,000 cubic yards being removed from 0.3 mile of drain. Two excavators were employed on drain cleaning. A small P. and H. excavator and force account team crew continued the lateral reconstruction. At the end of the month two new standard Ruth ditching machines were received on the project, one for the Mesilla Division and one for the El Paso Division. We were pleased to note that these machines contained some improvements in design, which correspond to those developed in connection with the machine formerly received on this project.

The director and the chief engineer met on the project on their way to attend the meeting of the Colorado River Commission, and spent two or three days considering river conditions in the El Paso Division.

Water for irrigation was run throughout the whole system during the entire month. Temperature of 14° above zero, the minimum for the winter, was recorded on the first of the month. This froze down alfalfa and some wheat, but caused little or no damage to fruit, as it had not begun to come out. In the Rincon and Mesilla Divisions considerable acreage has been planted to early cabbage.—*L. M. Lawson.*

NORTH DAKOTA PUMPING PROJECT.

The first half of March was practically open, but the second half was cold, with many storms which set

back neighborhood work already begun. The service work was not hampered, as the date had been set forward this year in line with a plan to reduce operation expense.

The irrigation district officials and project office were busy on work looking to increasing settlement and reducing size of farms. The irrigation district issued an attractive booklet descriptive of project lands and conditions.

Power plant operations were conducted without unusual incident. The energy sold was 92,300 kilowatt hours, compared with 92,490 for the same month of last year, which was considerably better than expected, in view of the general conditions.

Nine hundred and ninety tons of coal were mined. New and reduced coal-mining rates were posted March 31 to become effective April 1.—*Wm. S. Arthur.*

UMATILLA PROJECT, OREGON.

With the reservoir within 5,500 acre-feet of being full, plenty of water in the Umatilla River, and enough snow in the mountains to insure a good run-off, the water supply for the irrigation season is assured.

Because of the backward spring farm work was behind. Spring tooting of alfalfa, planting of gardens and early potatoes, pruning of orchards, and getting farm ditches in shape were generally engaged in during the latter part of the month.

Labor conditions were not satisfactory. The farmers were engaged on their places and the local supply was not adequate.

The Feed Canal was in operation throughout the month, discharging 16,651 acre-feet to Cold Springs Reservoir. At the close of the month a small head of water was used to prime laterals and pipe lines. A

Crop report, Umatilla project, Oregon, 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average (per acre.)	Per unit of yield.	Total.	Per acre.
Alfalfa.....	9,824	Ton.....	36,355	3.7	\$6.87	\$249,760	\$25.42
Alfalfa seed.....	89	Bushel.....	241	2.7	12.00	2,892	32.50
Apples.....	614	Pound.....	1,055,630	1,719.0	.035	36,948	60.17
Barley.....	34	Bushel.....	902	26.5	.69	622	18.30
Corn (Indian).....	116	do.....	3,006	25.9	.82	2,465	21.25
Corn (toddler).....	62	Ton.....	375	6.0	5.45	2,044	32.97
Fruits, small.....	41					4,542	110.78
Garden.....	195					19,946	102.29
Hay.....	155	Ton.....	191	1.2	8.10	1,547	9.98
Pasture.....	519					8,125	15.66
Peaches.....	38	Pound.....	59,840	1,575.0	.053	3,172	83.47
Pears.....	9	do.....	21,500	2,389.0	.05	1,075	119.44
Prunes.....	13	do.....	14,500	1,115.0	.05	725	55.77
Potatoes.....	83	Bushel.....	6,417	77.3	1.18	7,572	91.23
Rye.....	25	do.....	200	8.0	1.00	200	8.00
Wheat.....	45	do.....	520	11.6	1.12	582	12.93
Miscellaneous.....	39					1,673	42.90
Less duplicated areas.....	291						
Total cropped.....	11,610	Total and average.....				343,890	29.62
Nonbearing orchard.....	73						
Alfalfa (new).....	1,189						
Ground fall plowed.....	158						
Miscellaneous.....	200						
Less duplicated areas.....	80						
Total irrigated.....	13,150						
		Areas.....			Acres.	Number of farms.	Per cent of project.
		Total irrigable area farms reported.....			19,809	544	70.0
		Total irrigated area farms reported.....			13,150	544	46.4
		Under water right applications.....			12,728	534	45.0
		Under rental contracts.....			266	11	.9
		Miscellaneous.....			156	7	.5
		Total cropped area farms reported.....			11,610	544	41.0

¹ Departmental, 36 acres; vested water right, 120 acres; 8 farms duplicated.

small crew was employed repairing structures and pipe lines and cleaning laterals. There was no demand for irrigation water.

Construction, East Division.—During the month 42 lineal feet of concrete lining were placed in the A Canal, completing the program for the current fiscal year. On lateral extensions 750 feet of 16-inch concrete pipe were laid, 38 cubic yards of concrete lining placed, and 5 minor structures built. Betterment work consisted of the laying of 950 lineal feet of 20-inch, 330 lineal feet of 16-inch, and 860 lineal feet of 12-inch pipe and the building of 14 minor structures. The work accomplished this month will permit the abandonment of about 2 miles of the C Canal, from which seepage losses have been excessive.

West Division.—Work on the lateral system was confined to the placing of a few minor structures. Additional lateral construction consisted of laying 900 lineal feet of 16-inch pipe and placing 42 cubic yards of concrete lining.—*H. M. Schilling.*

KLAMATH PROJECT, OREGON-CALIFORNIA.

Climatic conditions during March were unfavorable for construction work and also for most farm activities. Until about the end of the month, project farms were covered to a depth of 4 to 6 inches with well-compacted snow; the ground was frozen to a depth of about 6 inches.

Sheep and cattle in large numbers were fed on the project farms during the winter. From present indications feeding will be continued until about May 1. A large part of the surplus hay crop will be fed before the stock can be returned to the range.

The diversion canal was operated throughout the month diverting flood water from Lost River to the Klamath River. During the latter part of the month Lost River was at a moderate flood stage.

One dragline excavator was operated throughout the month enlarging the C Canal. On March 29 the following performance was recorded: Mr. Ben Daniels, chief operator, on a type 30-B Bucyrus gasoline-driven dragline excavator with a one cubic yard

bucket excavated 1,158 cubic yards of material in 8 hours; the yardage was determined by actual cross-section measurements.

On March 22, the Langell Valley and Horsefly Irrigation Districts voted favorably on a proposed joint contract with the United States. The contract provides for the use of Clear Lake storage and for the construction of a distribution system for an area of about 8,350 acres. The action of the districts will result in the construction of irrigation works for the Clear Lake part of the Langell Valley Division as rapidly as funds can be made available.

On March 24 bids were opened for the construction of radial gate concrete checks on the J Canal. The work involves the placing of about 130 cubic yards of reinforced concrete. Only one bid was received, that of W. D. Miller, whose bid totaled \$5,839.50 — *Herbert D. Newell.*

BELLE FOURCHE PROJECT, SOUTH DAKOTA.

Roads were bad throughout the winter, but autos were running everywhere at the end of March.

Outside operations were light. A small crew spent a week replacing decayed timbers in the Indian Creek flume, but the work was interrupted by bad weather before being completed.

The maintenance foremen busied themselves during the greater part of the month repairing equipment and getting things lined up for work whenever the weather becomes fit.

The heavy drifting of snow during the winter so thoroughly filled all canals that it will be some time before repair work can be started.

The engineering force was employed in the office in connection with the proposed program of structure work for the Willow Creek extension. No definite plans, however, had been made owing to lack of information regarding allotment of funds for the next fiscal year.

Stock on the project were in good condition and it is thought that the hay supply will be adequate, although not in excess of the requirement.

Crop report, Klamath project, 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	16,375	Ton.....	48,515	2.95	\$5.00	\$242,575	\$14.81
Hay.....	747	do.....	817	1.10	5.00	4,085	5.47
Wheat.....	3,205	Bush.....	68,219	21.3	.90	61,397	19.10
Oats.....	1,998	do.....	72,594	36.3	.37	26,859	13.44
Barley.....	973	do.....	21,778	22.4	.53	11,542	11.87
Rye.....	410	do.....	5,690	13.9	.56	3,186	7.75
Potatoes.....	96	do.....	15,450	161.0	1.25	19,306	201.20
Garden.....	66	Acre.....			150.00	9,900	150.00
Pasture.....	8,850	do.....			6.00	53,100	6.00
Total cropped.....	32,720	Total and average.....				431,950	13.20
Not cropped.....	2,680						
Not reported.....	700						
Total irrigated.....	36,100						
		Areas.	Acres.		Number of farms.	Per cent of project.	
		Total irrigable area farms reported.....	42,142		412	100	
		Total irrigated area farms reported.....	36,100			85	
		Under water right applications.....	36,080			85	
		Total cropped area farms reported.....	32,720			78	

Sheepmen reported excellent luck with their lambing operations and the percentage of lambs is high. Hog men report bad luck in farrowing and a very light crop. The prices received for hogs and lambs continued very satisfactory.

Owing to the moist condition of the soil no farming operations were undertaken except in the sandy loam districts.—*B. E. Hayden.*

STRAWBERRY VALLEY PROJECT, UTAH.

March weather was unusually cold and unseasonable, with normal precipitation. Conditions were unfavorable for farming operations and very little spring plowing or planting had been accomplished. It was estimated that the present season is backward at least three weeks.

The price of cereals and hay remained about stationary throughout the month. Owing to protracted

winter, practically all stocks of hay and grain had been exhausted. Many shipments of live stock were made to Southern California points.

The power plant was in continuous operation and power furnished under contract to the several project towns, which consumed a total of 88,328 kilowatt-hours. Preparations were being made to clean the power canal prior to the irrigation season. Small repairs were contemplated to the joint canal between the tail race and the spillway at the plant.

Expectations were that the Spanish Fork River would be at the highest flood stage since 1909.

Collections of operation and maintenance and construction charges improved. At the end of the month about 65 per cent of the 1921 charges had been collected.

On March 31 Utah Lake reached a stage of 1.95 feet about compromise level, the highest point reached for several years.—*W. L. Whittemore.*

Comparison between operation and maintenance estimates and results, January 1 to March 31, 1922.

Projects.	Gross costs.				Net accruals and revenues.				Area for which water is available (acres).
	Estimate for 1922.		Actual cost to Mar. 31.	Amount *over or under.	Estimate for 1922.		Actual returns to Mar. 31.	Amount more or *less than estimate.	
	Total for year.	To Mar. 31.			Total for year.	To Mar. 31.			
PROJECTS UNDER PUBLIC NOTICE.									
Belle Fourche.....	\$70,000	\$5,000	\$6,500	*\$1,500	\$101,153				82,500
Boise.....	290,000	59,000	37,000	22,000	1 280,000				167,300
Carlsbad.....	52,000	11,500	11,500		1 56,625	\$8,000	\$4,500	*\$3,500	25,000
Huntley.....	45,000	8,800	6,300	2,500	1 47,000				30,000
King Hill.....	35,500	2,400	3,800	*1,400	1 35,500	2,400	3,800	1,400	16,900
Klamath.....	55,000	3,800	2,800	3,000	1 55,000	5,800	2,800	*3,000	51,000
Lower Yellowstone.....	39,000	3,000	1,700	1,300	1 36,000	3,000	1,700	*1,300	40,200
Minidoka (south side).....	94,000	17,000	10,000	7,000	1 95,300				49,000
Newlands.....	105,000	30,000	26,000	4,000	1 121,000				72,200
North Dakota pumping.....	35,000	3,600	3,600		1 30,820				7,650
North Platte (Interstate).....	165,000	25,000	20,000	5,000	1 166,700	1,500		*1,500	* 130,000
Okanogan.....	37,000	5,000	2,300	2,700	1 53,720	21,720	19,020	*2,700	8,460
Orland.....	35,000	9,000	5,600	3,400	1 35,230				20,500
Rio Grande.....	231,000	92,000	83,000	9,000	1 233,945	94,945	85,945	*9,000	116,000
Shoshone.....	70,000	8,500	8,300	200	1 75,750				71,100
Strawberry Valley.....	* 25,000	6,000	5,300	700	* 52,500	400	600	200	59,100
Sun River (Fort Shaw).....	15,500	2,700	800	1,900	1 15,600				13,900
Umatilla.....	37,280	8,000	7,000	1,000	1 37,280	8,000	7,000	*1,000	24,400
Yakima:									
Sunnyside.....	130,000	31,500	35,000	*3,500	1 148,776				103,000
Tieton.....	84,000	19,000	16,000	3,000	89,800				32,000
Yuma.....	260,000	44,000	44,000		1 275,000	56,000	50,000	*6,000	63,200
Total.....	1,907,280	396,800	336,500	60,300	2,042,699	201,765	175,365	*26,400	1,183,410
UNDER WATER RENTAL.									
Grand Valley.....	50,000	9,000	7,800	1,200	50,800	400	400		38,400
Milk River (including St. Mary).....	71,500	10,000	5,300	4,700	22,000				* 74,000
North Platte (Fort Laramie).....	70,000	14,000	8,700	5,300	53,000	2,800	2,800		43,100
Sun River (Greenfields and Big Coulee).....	25,000	1,600	1,300	300	30,000				28,500
Uncompahgre.....	135,000	35,000	44,000	*3,000	142,500	10,000	3,600	*3,400	100,000
Total.....	351,500	72,600	67,100	5,500	298,300	13,200	6,800	*6,400	284,300
INDIAN.									
Blackfoot.....	30,000	400	300	100	(7)				21,500
Flathead.....	69,740	(8)	(8)	(8)	(7)				105,000
Fort Peck.....	14,600	(8)	(8)	(8)	(7)				22,400
Total.....	114,340								148,900

¹ Tentative. Subject to checking by project.

² Returns regulated by district contract.

³ Includes 17,000 acres for which water is carried in main canal.

⁴ Not including tunnel repairs.

⁵ Includes instalment of \$25,000 for tunnel repairs.

⁶ Stored water is furnished through the St. Mary Canal for 21,600 acres additional.

⁷ Announcement of charges not yet received.

⁸ Report not received in time for publication.

OKANOGAN PROJECT, WASHINGTON.

The weather for March was colder than usual, with the greatest amount of precipitation on record for the month.

The master mechanic and helpers during the month removed the machinery at the Salmon Lake pumping plant from its location in the reservoir area and put it in storage above the high-water line and also were engaged in repairs to the Robinson Flat pumping plant and various other mechanical work.

The office force was employed on routine office work, the preparation of the annual project history, and in preparing data in connection with the proposed electrification of the Duck Lake pumping plant and Government wells Nos. 1 and 2, the concrete lining of laterals, and other work of similar nature.

A small amount of work was done in connection with preparing the canals and laterals for delivering spray and cistern water. The spring maintenance work was delayed owing to the frost not being out of the ground, and it will be impossible to accomplish much in this line before about April 10.—*Calvin Casteel.*

YAKIMA PROJECT, WASHINGTON.

March temperatures were below normal. Snow conditions at the storage reservoirs are shown in the following table:

Reservoir.	Snowfall during March.	Depth of snow Mar. 31.
	Inches.	Inches.
Keechelus.....	67½	61
Kachess.....	29	28
Cle Elum.....	4	6
Bumping.....	49½	49

Operation and maintenance, Sunnyside Division.—Priming of the main canal was delayed on account of frost in the canal banks. About 50 second-feet were turned in on March 27, and this was gradually increased to about 20 second-feet on the 31st. Maintenance work, which had been seriously delayed by the continued cold weather, was rushed to completion during the latter half of the month in order to have the system in shape for water delivery by April 1. The section of Mabton Siphon under the river was pumped out and inspected. It was found in very good condition. All the pumping plants were overhauled and by the end of the month were practically in shape for starting operation.

Tieton Division.—Diversion was made from Cowiche Creek during the latter half of the month to enable the farmers to fill their cisterns for stock and domestic use. Here, as on the Sunnyside Division, maintenance work was delayed by cold weather. Two men were occupied throughout the month in removing snow and rock from the main canal and adjusting the spillway machinery. A large snowslide which occurred about two months ago about one mile from Tieton Tunnel still covered the canal on the 22d of March for a distance of 75 feet to a maximum depth of about 12 feet. For the greater part of the month maintenance work was confined to cutting willows and repairing delivery structures. Temperatures continued too low to risk any concrete repairs. During the latter part of the month work was started on removal of silt from sublaterals, and approximately 2,300 linear feet of wood and sewer tile pipe, 6 inch

to 16 inch, were installed. A 36-foot section of concrete in D-1 Siphon, which failed last fall, was removed and replaced with 30-inch continuous wood-stave pipe. Work was also started on the substructure for 2,000 linear feet of 30-inch and 36-inch creosoted wood-stave flume, and on the installation of about 4,400 linear feet of 6-inch to 12-inch wood-stave pipe to replace equal lengths of the old wood flume.

Storage reservoirs.—At Keechelus, Kachess, and Cle Elum the gates remained closed throughout the month. At Bumping Lake the gates were wide open.

New divisions.—Work was continued on plans and estimates for the Roza Division. Canal lines were projected and maps, profiles, and canal sections prepared.

Miscellaneous.—The project manager gave some time to the study of plans now being revised by the Kittitas Reclamation District for the construction of the Kittitas Irrigation System. Contract was negotiated with the City of Cle Elum providing for change in point of diversion of the city's water supply.—*J. L. Lytel.*

TIETON DAM.

Winter conditions prevailed until about the middle of March, making any outside work difficult. The force was increased from 225 on the first to 360 on the last. While the labor centers were crowded with men looking for employment, yet good, experienced, and willing workers for this class of work were scarce.

The river section of the core wall was completed to about 20 feet above ground, and the concreting of the working shafts accomplished. About 1,000 cubic yards of boulders and gravel were removed above the core wall and placed in embankment near the lower toe. About 10,000 cubic yards of rock blasted down from the spillway were excavated with the Marion shovel and placed in the rock section below the core wall. Work was in progress on tracks and trestles for placing embankment. Sluicing equipment, consisting of pumps, motors, and pipe, was received and partially installed. Cableway towers were completed and concrete anchorages partially poured. The diversion dam was completed by raising about 5 feet.

The first serious interruption in the hydroelectric power plant occurred on the 31st, when a snow slide took out a section of power flume. The plant was in operation again after 14 hours. Roads to Naches were rapidly drying up and freighting service was being resumed. Bids were opened for hauling 3,600 tons from Naches to Rimrock; there were a large number of bidders and sharp competition. Contract was let for sawing and splitting 3,000 ricks of 30-inch wood for steam use.—*F. T. Crowe.*

RIVERTON PROJECT, WYOMING.

The weather was favorable for construction. The roads were in poor condition early in March but in good condition during the latter part of the month. The flow of Wind River was about normal.

Dragline 121322 resumed work on March 20, excavating 3,585 cubic yards from the First Division of the Wyoming Canal and stripping gravel pit and screening gravel for the diversion dam after March 24.

Dragline 121323 was used on the dike at the diversion dam, stripping 4,774 cubic yards from the dike site up to the eighth and loading 14,080 cubic yards on wagons for the dike embankment beginning March 8. Two shifts were operated beginning March 20.

Twelve cubic yards of class 3 material were excavated from cut-off trench at the diversion dam and 58 cubic yards of reinforced concrete were placed beginning March 30.

Dragline 121474 was operated two shifts on the Second Division, Wyoming Canal moving 20,440 cubic yards of sandstone.

One survey party located at Pavillion was employed on topographic surveys.—*H. D. Comstock.*

SHOSHONE PROJECT, WYOMING.

Frost was slow in coming out of the ground and the season was somewhat backward. Near the close of March plowing and disking were begun on the farm and shallow earthwork was possible.

Construction work.—Construction work was confined practically to power plant and transmission line work. At the close of the month the penstock at the power plant and the interior power house work were practically completed, and work was under way on the final connections of the turbines and generators to permit testing out the plant. The transmission line from the power plant to a mile east of Garland was completed, except for a small amount of work on the Powell substation wiring. The town of Powell electric power distribution system was completed during the month, including erection of ornamental street lighting on Bent Street, and was ready for the test.

On drainage construction a small amount of rock excavation was done on the Drain X system of the Garland Division, and several minor drainage structures were erected. On the Frannie Division a Class 9½ Bucyrus electric dragline, transferred from the North Platte project, was unloaded and erected. Water users of the Frannie Division were balloting on a supplemental construction charge to provide funds for drainage construction. The ballot closed April 15.

Operation and maintenance.—Ralston Reservoir was emptied and refilled from the river the last of the month to secure a fresh-water supply for the town of Powell. The principal maintenance work on the Garland Division consisted of repairs to the Garland Canal at the Cody Branch crossing. On the Frannie Division a small amount of minor structure construction and repair was done and a Ruth ditch cleaning machine, transferred from the Huntley project, was unloaded at Deaver, but has not as yet been tried out.—*J. S. Longwell.*

INDIAN PROJECTS, MONTANA.

BLACKFEET PROJECT.

Cold winter weather continued during nearly the whole of March and at the end of the month very little frost was out of the ground and it was impossible to do any construction or operation and maintenance work.

Construction work was confined to cutting lumber for a few minor structures in the yard at Browning warehouse. The operation and maintenance force was engaged in sawing lumber for minor structures, hauling coal for operation and maintenance camps, and making other preparations for the season's work. Engineering work consisted of making a preliminary survey and estimates for a proposed canal from Four Horns outlet to Blacktail Creek, a small amount of work on an engineering report for Cut Bank Irrigation District, and routine work.

Conditions were such that no farming operations other than feeding of stock and hauling a small

amount of grain to market were carried on. At the end of the month it was reported that nearly all of the hay in this section was used up and that some of the range stock was in poor condition, but that there had been only comparatively small losses up to that time.—*R. M. Snell.*

FLATHEAD PROJECT.

Weather conditions were severe during the first part of March and normal in the last part. Snow covered the irrigable lands up to the end of the month, melted slowly, and was absorbed largely by the ground. Reports of snow conditions in the mountains indicate a depth in excess of any year since records have been taken. The largest run-off in the history of the project is expected this year.

On account of the long feeding season the local supply of hay was exhausted and shipments were being received from other parts of the State and from Washington at a cost of about \$18 per ton at the receiving point. Indications were that winter wheat and alfalfa will be in excellent condition and prospects for a favorable crop season were much better than usual.—*C. J. Moody.*

FORT PECK PROJECT.

Cold weather and snow prevented outside work during March.

The small acreage of winter wheat was in fair condition and moisture conditions of the soil were favorable for the other crops to be sown, as most of the snow water had soaked into the ground.—*S. A. Kerr.*

GENERAL OFFICES.

Washington office.—Director Davis left Washington on March 6 for a western trip, spending several days on the Rio Grande project to confer especially regarding river conditions near Fabens and San Elizario Island. He then attended the meeting of the Colorado River Commission at Phoenix and accompanied the commission to the Boulder Canyon dam site, Imperial Valley, and Los Angeles, where further hearings were held on March 20 and 21. En route to Salt Lake City he visited Black Canyon dam site on March 22. At Salt Lake City the director conferred with engineer William M. Green with reference to investigations under his charge in connection with the Provo-Weber project, remaining in the city to attend the meeting of the Colorado River Commission on March 27 and 28.

During the absence of the director the office was in charge of Assistant Director Morris Bien, except for three days, when Mr. Bien was away, and Chief Counsel Hamele was in charge as acting director.

On March 31 the act was approved authorizing the Secretary of the Interior to extend the time of payment of charges due on reclamation projects. Application forms for relief and regulations, approved by the Secretary, were immediately prepared and sent to the projects.

Action was taken by the Secretary on the following matters, among others, submitted to him:

Recommending the purchase of 6 standard Ruth dredgers and 2 Baby Ruth dredgers at \$6,000 and \$4,000 each, respectively; approved March 2.

Reporting favorably on bill H. R. 10614, to encourage the development of the agricultural resources of the United States through Federal and State co-operation; signed March 13.

Recommending approval of contract with the Grand Valley Irrigation District and the Orchard Mesa Irrigation District providing for the reconstruction of the Orchard Mesa project as part of the Grand Valley project, subject to confirmation by the court and authorization by Congress to carry on the work, at an estimated cost of \$1,000,000; approved March 22.

Recommending execution of contract with New Mexico providing for payment by the United States of not to exceed \$12,000 toward the expenses of making a complete hydrographic survey of the water system of the Pecos River and its tributaries in New Mexico; approved March 24.

Reporting favorably on bill S. 3324, providing for the reservation of 200 farm units on the Yuma Mesa to be turned over to the Veterans' Bureau and later to be purchased by qualified ex-service men; signed April 5.

Recommending approval of public notices announcing operation and maintenance and water charges on the Belle Fourche, Boise, Huntley, Shoshone, North Platte, Sun River, and Newlands projects for the season of 1922 and thereafter until further notice, approved on various dates during the month.

Proof of the Boulder Canyon report, which was sent to Congress by the Secretary on March 1, was being read in the office during the month.

During the month 112 purchase orders were placed and 6 advertisements issued. Purchases amounted to \$5,380.83. The storehouse filled 232 requisitions and made 34 sales from stock, the total value amounting to \$2,360.24. Checking of the stock records was completed during the month and showed a total gross value of supplies of about \$43,000.

Publications issued during the month comprised 167 copies of the annual report and 880 miscellaneous reports and papers. The 42 mimeographed jobs amounted to a total run of 22,030 sheets.

The photographic laboratory turned out work during the month to the value of \$362.15, distributed as follows: Washington office, \$35.50; field, \$286.40; sales, \$40.25.

The settlement and information section answered 739 inquiries concerning the service and opportunities on the projects.

On March 31 the total number of inquiries from ex-service men concerning opportunities on the land amounted to 192,668.

Among the visitors to the office during the month were P. J. Ott de Vries, late head of the Department of Public Works in the Dutch East Indies, of The Hague, Holland, who has visited recently a number of the projects in the southwest; Messrs. Slattery and Kwiss, of the Wellman-Seaver-Morgan Co., Cleveland, Ohio, in connection with a study of the development of balanced valves by Reclamation Service engineers; and Project Manager Barry Dibble.

Denver office.—The chief engineer left Denver on March 10 to meet the director in El Paso. He then accompanied the director to Phoenix, where the first meeting of the Colorado River Commission was held, then visited Boulder Canyon, Imperial Valley, and Los Angeles. En route to Salt Lake City they stopped at Black Canyon. The chief engineer returned to Denver from Salt Lake City on March 25. Assistant Chief Engineer Charles P. Williams was in the field during the entire month visiting the Milk River, Flathead, Sun River, and Blackfoot projects.

The principal work accomplished in the Designing Section during the month consisted of the following: Prepared detail designs and estimates for tunnels,

main canals, and structures for the Baker (secondary) project; prepared preliminary design and estimate for dam at Boulder Canyon, storage 20,400,000 acre-feet; made studies to determine the most feasible way of enlarging capacity of Indian Creek flume, Belle Fourche project; prepared preliminary estimates for multiple arch and concrete-faced earth fill dams for Cold Springs reservoir, King Hill project; started design for wood-stave flume, Lost River, Klamath project; partially prepared detail designs for siphon and other structures and general designs for dam and outlet works, Pilot Butte reservoir, Riverton project; investigated use and arranged for purchase of Goldbeck pressure gages for testing pressure at Tieton dam, completed and checked final designs for spillway, prepared designs for core-wall inspection shaft, prepared designs for core-wall and made study of stress conditions likely to arise in concrete core-wall during construction for Tieton dam, Yakima project. Prepared detail designs for Wendelken interlocking concrete culvert units, turn-out units, and also prepared detail designs of metal forms for Wendelken units referred to above—all of this under standardization work.

The principal work accomplished in the Electrical Division consisted of completion of drawings of superstructure and by-pass chute of the Thomas Point pumping plant, Lower Yellowstone project; layout of the proposed reconstruction of the Duck Lake pumping plant, Okanogan project; preliminary layout of the proposed Pilot Butte power plant, Riverton project; transposition plan for eliminating inductive interference on the telephone lines in the Shoshone Canyon, Shoshone project; examination of a report of the test of the turbines at the Spanish Fork power plant, Strawberry Valley project. Detail designs of balanced needle valves for the Tieton dam were studied and a new form of operating device worked out, Yakima Storage project. A representative of this department visited the Yuma project and assisted in starting and testing the Yuma B Lift pumping plant.

In the Cost and Property Section arrangements were made for the transfer of a little over \$1,300 worth of equipment and supplies.

Among the more important matters considered in the Legal Division during the month were the consideration of the case of Allard v. Moody, involving water rights on the Flathead project; consideration of claims presented by residents in the vicinity of San Marcial, N. Mex., alleging damages due to backwater from the Elephant Butte reservoir; water rights on the Riverton project; issuance of public notice on the Uncompahgre project; water filings on the Baker (secondary) project; and proposed organization of an irrigation district, Milk River project.

An average of 353 letters per day were received during the month; 757 vouchers were handled, involving a total amount of \$162,503.67. In the Purchasing Division 346 advertisements were issued and 471 vouchers prepared, involving a net expenditure of \$96,871.06.—*F. E. Weymouth.*

The price received for shipments of hay from the Shoshone project since the first of the year has been much better than before that date, and many carloads billed out during February netted the growers as much as \$10 per ton, so that the disposition of the surplus hay on the project is no longer a serious problem.

ADMINISTRATIVE ORGANIZATION.

DEPARTMENT OF THE INTERIOR.

Hon. ALBERT B. FALL, Secretary of the Interior.
 EDWARD C. FINNEY, First Assistant Secretary.
 FRANCIS M. GOODWIN, Assistant Secretary.
 EDWIN S. BOOTH, Solicitor for the Interior Department.
 CHARLES V. SAFFORD, Administrative Assistant to the Secretary.
 HARRY G. CLUNN, Private Secretary to the Secretary.
 JOHN HARVEY, Chief Clerk and Superintendent of Buildings.

U. S. RECLAMATION SERVICE.

WASHINGTON, D. C.

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El Paso, Tex.—P. W. Dent, district counsel. Projects: Rio Grande, Carlsbad, and Hondo.

Las Cruces, N. Mex.—Mark B. Thompson, attorney in charge of litigation on Rio Grande and Carlsbad projects.

Helena, Mont.—E. E. Roddis, district counsel, Helena, Mont. Projects: Blackfeet, Flathead, Fort Peck, Huntley, Milk River, St. Mary Storage, Sun River, North Dakota Pumping, Lower Yellowstone, and Shoshone.

Mitchell, Nebr.—J. N. Beardslee, district counsel. Projects: North Platte, Belle Fourche, and Riverton.

Montrose, Colo.—J. R. Alexander, district counsel, Projects: Grand Valley, Uncompahgre, and Strawberry Valley.

Portland, Oreg.—H. L. Holgate and D. G. Tyree, district counsel. Projects: Yakima, Okanogan, Umatilla, and Kiamath.

San Francisco, Calif.—Henry A. Cox and Brooks Fullerton, district counsel, 349 Pacific Building. Projects: Salt River, Yuma, Orland, and Newlands.

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St. Mary Storage Division.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk; H. E. Bruce, fiscal agent.

Salt River Project.—Being operated by the Salt River Valley Water Users' Association; C. C. Cragin, general superintendent and chief engineer, Phoenix, Ariz.

Shoshone Project.—J. S. Longwell, project manager, Powell, Wyo.; J. R. Iakisch, engineer; C. M. Jump, superintendent of Irrigation; W. F. Sha, chief clerk; Miss L. C. Drinkwater, fiscal agent.

Strawberry Valley Project.—W. L. Whittemore, project manager, Provo, Utah; J. E. Overlade, chief clerk and fiscal agent.

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Yuma Project.—P. J. Preston, project manager, Yuma, Ariz.; R. M. Priest, superintendent of construction; S. A. McWilliams, engineer, Yuma Mesa Division; E. R. Scheppele-mann, chief clerk; E. M. Philbaum, fiscal agent.

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Flathead Project.—C. J. Moody, project manager, St. Ignatius, Mont.; J. M. Swan, chief clerk; J. P. Siebenelcher, fiscal agent.

Fort Peck Project.—S. A. Kerr, project manager, Poplar, Mont.; Henry Berryhill, chief clerk and fiscal agent.

The Reclamation Record

An ADMINISTRATIVE and STATISTICAL REPORT

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MAY, 1922

IRRIGATION HAS HELPED MATERIALLY IN PRODUCING THESE RESULTS.

Orland Project, California.

Values created.

Value of project lands and improvements	\$5,557,810
Value of project live stock	519,269
Value of project equipment	352,293
Total	6,429,372

Estimated value of lands now within limits of project before the advent of Government irrigation (\$30 per acre)	605,000
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Assessed valuation.

Project property	2,577,000
Town of Orland	1,384,000
Total	3,961,000
Value of crops produced in 1921	495,810
Total value of crops produced since 1911	4,307,000

Carload shipments of agricultural products, 1921.

Alfalfa meal	99
Alfalfa hay	21
Grain	100
Fruits and nuts	16
Live stock	108
Total	344

Miscellaneous statistics.

Number of farms	663
Number of towns	1
Population of farms	1,892
Population of towns	1,700
Total	3,592

Irrigable area of project.

Area farm unit plats	20,176
Vested rights	320
School and town sites	58
Total	20,554

Acreage under irrigation	14,697
Acreage cropped	11,447
Public schools	10
Churches	7
Newspapers	2
Banks	2
Capital stock	\$196,000
Deposits	\$896,000
Number of depositors	2,800

Industries.

1 Alfalfa meal mill.	2 Restaurants.
2 Creameries.	2 Gasoline and oil plants.
1 Sand and gravel plant.	4 Service stations.
1 Warehouse company.	2 Plumbing shops.
2 Lumber yards.	1 Harness shop.
6 Garages.	3 Drug stores.
3 Hardware stores.	1 Millinery store.
5 Dry goods and grocery stores.	1 Shoe store.
1 Clothing store.	3 Cigar stores.
2 Feed stores.	1 Electrical supply store.
2 Hotels.	2 Meat markets.
	12 Miles railroad.

Minidoka Project, Idaho.

This project, located in southern Idaho, is a good example of the substantial returns of irrigation development. In 1904 it was an uninhabited sage brush desert, no towns, no farms, no railroads, no facilities of any kind. All that it is to-day is the result of the construction of the irrigation works by the United States Reclamation Service. The cost of reclaiming the present irrigated area of 121,000 acres has been \$5,800,000. Of this amount \$1,600,000 has been repaid.

The project includes several large undertakings outside the present irrigated area. The Jackson Lake Reservoir supplies water to 630,000 acres besides the land for which the Government has built the canals. The American Falls Reservoir, when completed, will furnish water to safeguard the crops on 900,000 acres that are now in cultivation and a complete water supply for 450,000 acres of new land, most of which will probably be available for homestead entry. A proposed extension adjoining the present irrigated

area on the north and west contains 115,000 acres of public land. The net construction cost of the entire project has been \$7,200,000, of which \$2,600,000 has been repaid.

The following figures show the conditions on the original 121,000 acres during 1921, a year of marked depression. They have been collected by the local commercial organizations or from the records of the United States Reclamation Service:

Values created.

Value of farm lands and improvements on project, estimated by the owners at the close of 1921	\$20, 836, 000
Value of live stock	1, 285, 000
Value of equipment	883, 000
Total	23, 004, 000

Assessed valuations.

Farms	\$7, 500, 000
Towns	3, 400, 000
Public utilities	3, 500, 000
Total	14, 400, 000
Value of crops produced in 1921	3, 409, 000
Value of crops produced since 1909	33, 000, 000

Shipments of agricultural products, 1921.

	Cars.
Potatoes	1, 560
Beets	920
Live stock	670
Grain and flour	570
Hay	450
Miscellaneous	330
Total	4, 500

Wholesale purchases of manufactures during 1921.

Dry goods, clothing, shoes	\$600, 000
Groceries	500, 000
Lumber, cement, brick, etc.	400, 000
Hardware	350, 000
Coal, feed, flour, and bags	300, 000
Automobiles, trucks, etc.	300, 000
Farm implements	200, 000
Machinery and supplies	200, 000
Electrical supplies	100, 000
Jewelry and miscellaneous instruments	100, 000
Cigars and tobacco	100, 000
Drugs and sundries	90, 000
Confectionery	90, 000

Furniture	\$50, 000
Other merchandise	50, 000

Total for one year 3, 430, 000

Other significant statistics, 1921.

Number of farms	2, 454
Number of towns	6
Population of entire project	17, 300
Acres supplied with water	121, 000
Acres in crop	110, 000
Public schools	22
Churches	29
Newspapers	5
Banks	6
Capital stock	\$190, 000
Deposits	\$1, 140, 000
Number of depositors	5, 900
Miles of graveled roads	260
Additional mileage graded roads	80
Cost of roads	\$1, 350, 000
Miles of railroads	52

Industries.

2 sugar factories.	1 potato-drying plant.
3 cheese factories.	2 alfalfa mills.
3 creameries.	1 mixed-feed mill.
3 flour mills.	2 feeder yards, etc.
1 brickyard.	

Electric power generated in project power house, 10,000 horsepower:

Pumps water for 53,000 acres.
Supplies all towns and factories.
1,200 farms also use this power.

Huntley Project, Montana.

The Huntley project is located in Yellowstone County, Mont., the western end being about 16 miles from Billings and on the south bank of the Yellowstone River, from which it derives its water supply. Prior to the time of opening of this project in June, 1907, the area was chiefly a sage and greasewood flat. Since that time the maximum crop production for a single year has reached undreamed-of figures.

The following information reflects the status of the project in 1921:

Values created.

Value of farm land and improvements on the project estimated by the owners at the close of 1921	\$3, 265, 205
Value of live stock	268, 870
Value of equipment	165, 065
Total	3, 699, 140
Values of crops produced in 1921	469, 315

Assessed valuations.

Farms	\$3, 005, 751
Towns	304, 125
Public utilities	2, 721, 244
Total	6, 031, 120

Carload shipment of products and supplies from and to the project in 1921.

Commodities.	From—	To—	Commodities.	From—	To—
Hay.....	32	10	Apples.....	.....	2
Wheat.....	209	2	Beet seed.....	0	.....
Beets.....	804	.....	Beet pulp.....	0	.....
Grain, flours and feeds.....	17	15	Flour.....	0	2
Potatoes.....	11	1	Wood.....	2	.....
Hogs.....	5	1	Brick.....	0	2
Sheep.....	41	14	Corn.....	0	8
Cattle.....	13	.....	Miscellaneous.....	3	3
Horses.....	2	.....	Machinery.....	.....	2
Emigrants.....	18	7	Cil.....	.....	2
Lumber.....	5	20	Gasoline.....	.....	14
Cement.....	0	9	Steel.....	.....	2
Household goods.....	3	.....	Coal.....	0	81
			Total.....	1, 165	197

The above figures, however, do not take into account the large amount of material of less than carload lots which arrive daily both by railroad and trucks.

Industries.

Number of farms.....	601
Number of towns.....	6
Population	2, 534
Area supplied with water, 1921.....	18, 800
Area in crop.....	18, 800
Public schools.....	7
High schools.....	1
Churches.....	7
Newspapers.....	1
Banks.....	4
Capital stock.....	\$100, 000
Deposits	\$402, 282

Industries.

Creameries.....	1
Elevators.....	5
Railroads.....miles.....	45
Water supply derived from the Yellowstone River with no storage facilities.	
Water is pumped for.....acres.....	5, 400
Miles of canal operated.....	299
Miles of closed tile drains maintained.....	51. 50
Miles open drains maintained.....	16. 50

Newlands Project, Nevada.*Values created.*

Value of farm land and improvements on project estimated by the owners, December, 1921	\$6, 583, 061
Value of live stock.....	1, 133, 711
Value of farm equipment.....	374, 901
Total	8, 091, 673

Assessed valuation.

Farms	\$2, 502, 935
Towns	1, 255, 318
Public utilities.....	4, 004, 227
Total	7, 762, 480
Value of crops produced in 1921.....	1, 254, 582

Shipment of agricultural products, 1921.

	Cars.
Hay.....	834
Potatoes.....	31
Cattle.....	300
Wheat.....	9
Sugar.....	8
Miscellaneous	108
Total.....	1, 290

Other significant statistics, 1921.

Number of farms.....	788
Number of towns.....	5
Population	5, 152
Acres supplied with water.....	46, 143
Acres in crops.....	43, 433
Public schools.....	11
Churches	6
Newspapers	3
Banks.....	1
Capital stock.....	\$75, 000

Industries.

Sugar factory.....	1
Flour mill.....	1
Alfalfa meal mills.....	2
Creamery.....	1
Railroads.....miles.....	50
Electric power generated in project power house.....horsepower.....	2, 500
Water supply of project, Truckee River, with storage in Lake Tahoe.....acre-feet.....	60, 000
Carson River, with storage in Lahontan reservoir, capacity.....acre-feet.....	290, 000

Rio Grande Project, New Mexico-Texas.

Determination of the exact extent to which development within the limits of the project is due to the operations of the Reclamation Service is rendered impossible by reason of there being a large city within its borders; also that there are other irrigated tracts immediately adjoining the project, and other industries, such as stock raising, mining, and manufacturing, which have contributed largely to the growth and affected the volume of business done in the larger towns.

In the following statements only such items are included as permit of no question as to the results obtained being due to the operations of the Service. As the Rio Grande project had been settled for a long period of time, and irrigation under the community ditch system practiced, the available flow in the Rio Grande all being utilized, comparative figures, where given, are based on conditions at the time stored water became available as a result of the completion of Elephant Butte Dam.

Project growth.

	1914	1921	Increase.
Number of farms irrigated.....	1,706	3,204	1,498
Number of acres irrigated.....	69,598	77,661	8,063
Number of acres irrigable.....	74,711	115,000	40,289
Population of farms.....	7,662	11,774	4,112
Number of towns (excluding El Paso) ..	24	28	4
Population of towns (excluding El Paso)	13,320	15,170	1,850

Values created.

	1914	1921	Increase.
Value of farms.....	\$9,920,325	\$15,254,960	\$5,434,635
Value of equipment.....	429,674	469,216	39,542
Value of live stock.....	796,376	1,134,964	338,588
Total.....	11,046,375	16,859,140	5,812,765

Value of crops raised in 1921.....	\$2,493,710.30
Cotton gins.....	10
Flour mills.....	7
Canneries.....	3

The general average for crop production was probably not more than 65 per cent of normal in 1921, as much of the project land was still undrained or had not entirely recovered, after being drained. Water logging began to be serious in 1915 and increased rapidly until 1918, when drainage work on a large scale was commenced. Alfalfa in particular was very seriously affected and has only partially regained its former productivity.

Purchase of agricultural implements from local dealers increased from \$38,000 in 1914 to \$165,000 in

1920. These figures represent manufacturer's prices f. o. b. factory and do not include automobiles, trucks, or tractors. Tractor sales for the same year amounted to \$45,000.

Disbursements made by Reclamation Service which have influenced to large extent the growth and prosperity of the project cities and towns.

	1914 to 1920, inclusive.	1921	Total.	Annual average.
Payments for labor.....	\$4,050,933.94	\$710,403.37	\$4,761,337.31	\$595,167.16
Payments to project contractors.....	914,836.14	114,513.18	1,029,349.32	128,668.16
Purchases from project dealers.....	1,580,129.99	248,699.48	1,828,829.47	228,603.68
Total distributed on project.....	6,545,900.07	1,073,616.03	7,619,516.10	952,439.00

Sun River Project, Montana.

Values created.

Lands and improvements end of 1921.....	\$2,078,000
Live stock.....	243,000
Farm equipment.....	213,000
Total.....	2,534,000

Assessed valuations (estimated).

Farms.....	\$1,850,000
Towns.....	300,000
Public utilities.....	1,870,000
Total.....	4,020,000

Value of crops produced in 1921.....	290,300
Value of crops 1913 to 1921, inclusive.....	1,868,000

Shipments of agricultural products, 1921.

	Cars.
Hay.....	173
Wheat.....	109
Potatoes.....	28
Sheep.....	14
Flax.....	4
Total.....	328

Miscellaneous statistics, 1921.

Number farms irrigated.....	377
Number towns.....	4
Population, farms.....	949
Population, towns.....	398
Total.....	1,347

Acreage irrigated	21,754
Acreage cropped	21,095
Public schools	17
Churches	11
Newspapers	2

Banks, number	3
Capital stock	\$65,000
Deposits	\$150,000
Depositors	750
Railroads	miles 104

SUMMARY OF CROP REPORTS ON RECLAMATION PROJECTS IN 1921.

NOTE.—These figures are limited to irrigated crops covered by crop census on Government projects proper, excluding dry-farm crops and all crops on most areas served stored water under the Warren Act.

Crop.	Acreage cropped.		Crop value.		Per cent.
	Total.	Per cent.	Average per acre.	Total.	
Cereals:					
Barley.....	33,574	2.9	\$16.66	\$559,327	1.1
Corn.....	52,506	4.6	14.65	769,228	1.6
Oats.....	55,427	4.8	10.42	577,787	1.2
Rye.....	1,511	.1	8.61	13,011	.....
Wheat.....	156,621	13.6	26.29	3,116,862	6.3
Total.....	299,639	26	16.80	5,035,215	10.2
Other grain and seed:					
Alfalfa seed.....	19,571	1.7	29.20	571,447	1.2
Clover seed.....	10,804	.9	36.40	393,316	.8
Grain sorghum.....	36,548	3.2	21.14	772,615	1.5
Flaxseed.....	376	.....	6	2,232	.....
Millet seed.....	243	.....	7.20	1,747	.....
Total.....	67,542	5.8	25.78	1,741,357	3.5
Hay and forage:					
Alfalfa hay.....	460,523	39.8	23	10,505,944	21.2
Clover hay.....	10,998	.9	7	75,511	.1
Other hay.....	28,345	2.4	14.55	412,475	.9
Corn fodder.....	5,426	.5	13	70,391	.1
Other forage.....	4,119	.4	20.91	86,130	.2
Pasture.....	122,418	10.6	9.13	1,118,086	2.2
Total.....	631,829	54.6	19.42	12,268,567	21.7
Vegetables and truck:					
Beans.....	2,564	.2	48	122,470	.3
Onions.....	573	.....	146	255,536	.5
Potatoes, white.....	51,559	4.5	142.86	7,366,051	14.8
Potatoes, sweet.....	702	.....	123.77	86,890	.2
Truck.....	19,506	1.7	119.61	2,333,174	4.7
Total.....	74,901	6.4	135.70	10,164,121	20.5
Fruits and nuts:					
Apples.....	27,560	2.4	288.97	7,961,406	16
Peaches.....	1,980	.1	200	396,428	.8
Pears.....	3,747	.4	135.40	507,284	1.2
Prunes.....	1,186	.1	145	171,846	.3
Citrus fruit.....	1,818	.1	365.07	663,702	1.3
Small fruit.....	1,545	.1	333.13	514,689	1
Miscellaneous.....	2,669	.2	122.74	327,592	.6
Total.....	40,505	3.4	260.35	10,545,647	21.2
Miscellaneous:					
Sugar beets.....	40,895	3.5	66	2,690,001	5.4
Cotton.....	102,087	9	65.51	6,688,195	13.5
Cotton seed.....	1,953	.1	20.83	40,683	.1
Cane.....	8,268	.7	53.88	445,514	.9
Other crops.....					
Total.....	153,203	13.3	64.39	9,864,393	19.9
Duplication.....	109,722	9.5			
All crops.....	1,157,900	100.0	42.85	49,620,300	100.0

Dry-farmed and Irrigated Crops on Milk River Project.

Project Manager Stratton of the Milk River Project, Montana, comments as follows on the reports of dry-farmed and irrigated crops, published in the RECLAMATION RECORD of February, 1922, pages 32 and 33:

The lower crop value per acre as a whole on irrigated land as compared with that of dry-land crops is due in large part to the fact that about 50 per cent of the irrigated area is in native hay and only about 30 per cent of the dry area is in that crop. This native hay has a value of around \$4.50 to \$5 as compared with \$8 to \$11.50 for the acreage over the project and thus has more of an effect in reducing the return on the irrigated than on the dry land.

In regard to alfalfa, the price was so low that some of the farmers did not cut their fields, or cut only once. This applies to a greater extent on the irrigated than on the dry lands. Three of the large landowners having in the aggregate about 900 acres of alfalfa or 26 per cent of the total of the irrigated alfalfa fields, cut their fields only once, obtaining therefrom a yield of about 1 ton per acre. Had these three farmers made three cuttings or even two cuttings the result shown would probably have looked better. Alfalfa was also damaged to some extent by heavy rains in June just after having been irrigated. Or to put it in another way, irrigation was a damage to alfalfa crops in these cases.

In regard to barley, there were only 10 acres on the irrigated area and 14 acres on the dry farmed. These areas are too small to give any very reliable comparison and moreover the irrigated field was on some heavy gumbo soil in the vicinity of Alkali Creek.

For beans the records are for 1 acre irrigated and 3 acres dry farmed. This also is a case where the acreage is too small to show a reliable comparison, and moreover, the acre irrigated was on alkali land where a high yield could not be expected until the land is brought into better condition.

The gardens reported are small areas as low as one-quarter of an acre. In general the dry-land gardens are located in more sheltered spots and had the advantage of sandy loam soils along the river banks.

The per acre value of native hay is not very widely different between the irrigated and dry. Irrigation of many of the blue-joint meadows was followed by heavy June rains, which likely decreased the yield in some cases and certainly was injurious to the quality in many cases. Also it is probable that the irrigated reports were more complete in taking areas of low and unprofitable production.

In regard to wheat and flax the irrigation was in some cases applied after the weather had become hot, so that the grain was scalded. In other cases the heavy June rains immediately followed irrigation.

The following items set forth the opinion of this office in general as to the explanation of low production for grain crops and it is to some extent applicable to other crops:

1. Lack of skill or care on the part of the irrigator.
2. June irrigation followed by heavy rain.
3. It is also noted that the best dry-land crop reports were those that occurred on sandy loam in sheltered spots along the river; these crops tended to increase the average production on dry farms.
4. In nearly every case crops grown on dry farms were produced on ground that had been previously

irrigated and cultivated, thereby gaining considerable advantage over quite a number of the irrigated wheat crops which were produced on first-year land.

The rainfall at Malta during the growing season of 1921, was 10.85 inches, of which 4.29 inches fell in June. At Glasgow the rainfall was 12.6 inches, of which 6.35 inches fell in June. Under such conditions of rainfall and the type of crops now produced on the Milk River project the dry-farm crops will naturally make a relatively good showing as compared with irrigated crops.

RATING CURVES FOR CANAL HEAD GATES.

A GREAT many attempts have been made to "rate" canal gate structures of the type shown in Figure 1, usually without success. A more or less general impression now prevails that these outlets can not be rated. A rating curve for such a structure would in a great many cases be of value even though it might be lacking in extreme accuracy. Approximate measurements of quantities are often required at points where the installation of an accurate measuring device is not warranted.

Observations have generally been directed toward finding a coefficient, which we will here call C' , for use in the formula,

$$V_1 = C' \sqrt{2gh_2} \quad (1)$$

where V_1 is the mean velocity through the gate opening. It can be shown theoretically that C' can not be a constant. The discharge through the orifice is not produced by the apparent head h_2 , but by some larger head h_1 which obtains immediately below the gate. The relation of h_1 to h_2 depends upon the velocity head recovered between A and B, Figure 1. If h_2 is measured just inside the barrel, or against the head wall just outside, the corresponding mean velocity may be taken as the discharge divided by the area of the barrel, provided, of course, that the tube is running full. If the gate is wide open the velocities at A and B will be the same, and h_1 will be equal to h_2 . If the gate is, say, three-quarters closed, the velocity at A will be four times as great as at B, the corresponding velocity heads having a ratio of 16 to 1. If the gate is half closed the velocity head at A will be four times that at B; and so on for other percentages of gate opening. As in any other type of transition a part of the reduction in velocity head between A and B will be recovered and will be manifested as pressure head at B. This recovery added to h_2 will give h_1 .

The relation between h_1 and the mean velocity through the gate is determined from the usual orifice formula—

$$V_1 = C \sqrt{2gh_1} \quad (2)$$

where C is an experimental constant depending upon the details of the orifice. The recovery of head may be assumed to be

$$R = \frac{K}{2g} (V_1^2 - V_2^2) \quad (3)$$

K being a factor giving the proportion of recovery possible under the given conditions.

It is desired to find V_1 in terms of C , K , and h_2 . It will be necessary to introduce a fourth factor to represent the ratio of V_1 to V_2 . Where the gate and the tube are of the same width this ratio, which we may designate by r for convenience, is equal to d_1 divided by d_2 (see Figure) and we may write

$$V_2 = \frac{d_1}{d_2} V_1 = r V_1 \quad (4)$$

Inserting this value for V_2 in equation (3) gives—

$$R = \frac{K}{2g} V_1^2 (1 - r^2) \\ = KC^2 h_1 (1 - r^2) \quad (5)$$

Therefore, since

$$h_1 = h_2 + R$$

we may write

$$h_1 = h_2 + KC^2 h_1 (1 - r^2)$$

whence

$$h_1 = \frac{h_2}{1 - KC^2 (1 - r^2)} \quad (6)$$

Placing this value of h_1 in equation (2) gives—

$$V_1 = C \sqrt{\frac{2gh_2}{1 - KC^2 (1 - r^2)}} \quad (7)$$

The coefficient C' in equation (1) may therefore be expressed thus:

$$C' = \frac{C}{\sqrt{1 - KC^2 (1 - r^2)}} \quad (8)$$

For high values of C and K , C' may readily exceed unity for small gate openings. With the gate fully open $C' = C$.

The relation of C' to r for $C=0.8$ and $K=0.6$ is shown in Figure 2. A number of observations made by Assistant Engineer W. G. Steward for a turnout on the Boise Project are also plotted on this diagram. It will be noted that the observed points follow, in a general way, the theoretical line. Additional ratings are to be made for this same outlet in the hope that a definite curve for C' can be found. If C and K are constants the final line should follow the general form of the theoretical curve shown in Figure 2. It may be found, however, that these functions are variable, and that some arbitrary straight or curved line best represents the variation in C' .

After a curve for C' is found a rating diagram can be constructed similar to Figure 3. If logarithmic coordinates are used all lines will be straight, but plain coordinates may be used if desired. Curves for d_1 may be plotted for each 0.10 foot, or at closer intervals if required. It may be found convenient in rating a given outlet to use d_1 rather than r as an argument in Figure 2.

If there is any considerable velocity of approach the corresponding velocity head should be added to h_2 . If the barrel is long the friction may affect the apparent values of C and K , but should not interfere with the rating of the outlet. It is not recommended at present that data taken for one outlet be used for another, but in case such a procedure is found desirable the effect of friction in the barrel should be considered.

If the tube is only partly full at the outlet end both d_1 and h_2 should be measured to the water surface at the end of the barrel. Figure 3 is not applicable to such cases.

It is not expected that a head gate can be made to serve as an accurate measuring device, as compared to the weir, but it may be possible, by following the procedure recommended, to secure more consistent results than have been obtained in the past. It is suggested that all such ratings made in the future be submitted for publication in the form of data cards, if found suitable.—Julian Hinds, engineer, U. S. R. S.

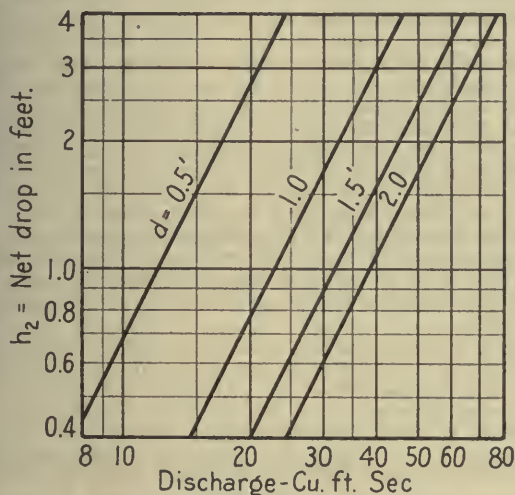


FIG. 3.
RATING CURVE FOR 3'-0" x 2'-0" OUTLET
 $C=0.8, K=0.6$

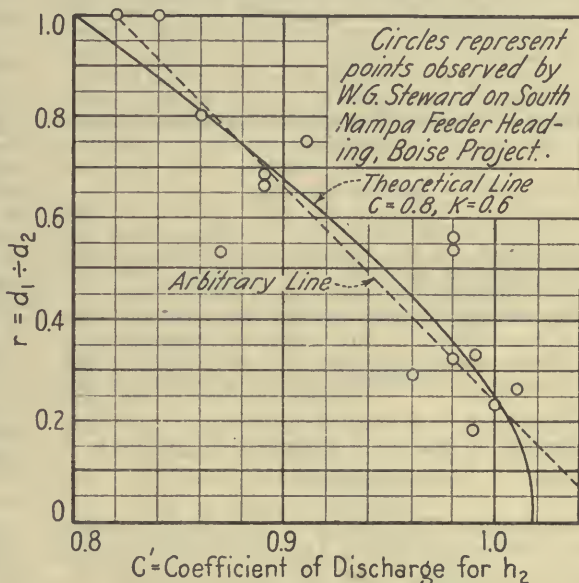


FIG. 2
THEORETICAL AND ACTUAL VALUES OF C'

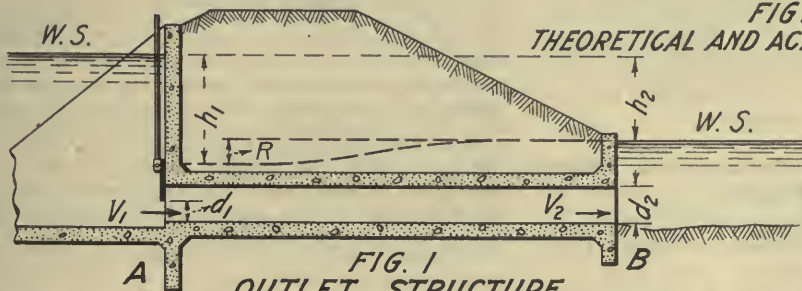


FIG. 1
OUTLET STRUCTURE

3-30-22

X-C-190

Typical turnout and rating curve.

RECLAMATION LAW NOTES.

Taxation of Public Land.

IN THE case of *Irwin v. Webb* (66 L. ed. 333) the United States Supreme Court makes the following holdings regarding the taxation of public land:

Land in a Federal irrigation project constructed under the act of June 17, 1902 (32 Stat., 388), for which a patent has issued conveying a fee in the land, subject to a lien of the United States, superior to all others, for future installments of water charges, is subject to State taxation.

A State may tax public land when the United States has, by final certificate, parted with the equitable title to a person subject to State taxation, and retains only the legal title by its delay in issuing the patent, but not until the equitable title passes can the State tax the entryman, except in the case of mining claims, and in cases in which express authority to tax is given by statute.

For purposes of State taxation the interest which an entryman has in land in a Federal irrigation project is not put in the same category as a mining claim by the provisions of the assignment act of June 23, 1910 (36 Stat., 592). The evident and sole purpose of this statute was to enable an entryman whose entry was cut down in area by the Secretary of the Interior in prescribing farm units, to dispose of his surplus to another who would be able to hold it, fulfill conditions, and secure a patent, and avoid a relinquishment or cancellation of the surplus, which had been the consequence before the act.

A homestead entryman on land within the Salt River Federal irrigation project in Arizona does not, upon fulfilling all the requirements of the original homestead act of May 20, 1862 (12 Stat., 392), acquire an equitable title from the United States taxable by Arizona, where a number of important steps remain to be taken by such entryman in proving his claim under the reclamation act of June 17, 1902. Such interest is not taxable until final certificate has issued.

Assessment of Railroad Property in Drainage Districts.

Traffic benefits resulting from the haul of increased croppage on lands within a drainage district, because of overflow protection, are sufficient to authorize assessment of railroad property for improvements within such district, though there were no direct benefits by way of protecting the company's right of way from overflow. (*Thomas v. Kansas City Southern Ry. Co.*, 277 Fed., 708.)

Irrigation Districts and Farm Loans on Federal Irrigation Projects.

An act to provide for the application of the reclamation law to irrigation districts. (Act May 15, 1922, Public No. 219, 42 Stat., —.)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress

assembled, That in carrying out the purposes of the act of June 17, 1902 (Thirty-second Statutes, page 388), and acts amendatory thereof and supplementary thereto, and known as and called the reclamation law, the Secretary of the Interior may enter into contract with any legally organized irrigation district whereby such irrigation district shall agree to pay the moneys required to be paid to the United States, and in such event water-right applications on the part of landowners and entrymen, in the discretion of the Secretary of the Interior, may be dispensed with. In the event of such contract being made with an irrigation district, the Secretary of the Interior, in his discretion, may contract that the payments, both for the construction of irrigation works and for operation and maintenance, on the part of the district shall be made upon such dates as will best conform to the district and taxation laws of the respective States under which such irrigation districts shall be formed, and if he deem it advisable he may contract for such penalties or interest charges in case of delinquency in payments as he may deem proper and consistent with such State laws, notwithstanding the provisions of sections 1, 2, 3, 5, and 6 of the reclamation extension act approved August 13, 1914 (Thirty-eighth Statutes, page 686). The Secretary of the Interior may accept a partial payment of the amount due from any district to the United States, providing such acceptance shall not constitute a waiver of the balance remaining due nor the interest or penalties, if any, accruing upon said balance: *Provided*, That no contract with an irrigation district under this act shall be binding on the United States until the proceedings on the part of the district for the authorization of the execution of the contract with the United States shall have been confirmed by decree of a court of competent jurisdiction, or pending appellate action if ground for appeal be laid.

Sec. 2. That patents and water-right certificates which shall hereafter be issued under the terms of the act entitled "An act providing for patents on reclamation entries, and for other purposes," approved August 9, 1912 (Thirty-seventh Statutes at Large, page 265), for lands lying within any irrigation district with which the United States shall have contracted, by which the irrigation district agrees to make the payment of all charges for the building of irrigation works and for operation and maintenance, shall not reserve to the United States a lien for the payment of such charges; and where such a lien shall have been reserved in any patent or water-right certificate issued under the said act of Congress, the Secretary of the Interior is hereby empowered to release such lien in such manner and form as may be deemed effective; and the Secretary of the Interior is further empowered to release liens in favor of the United States contained in water-right applications and to assent to the release of liens to secure reimbursement of moneys due to the United States pursuant to water-right applications running in favor of the water users' association and contained in stock subscription contracts to such associations, when the lands covered by such liens shall be subject to assessment and levy for the collection of all moneys due and to become due to the United States by irrigation

districts formed pursuant to State law and with which the United States shall have entered into contract herefor: *Provided*, That no such lien so reserved to be United States in any patent or water-right certificate shall be released until the owner of the land covered by the lien shall consent in writing to the assessment, levy, and collection by such irrigation district of taxes against said land for the payment to the United States of the contract obligation: *Provided further*, That before any lien is released under his act the Secretary of the Interior shall file a written report finding that the contracting irrigation district is legally organized under the laws of the State in which its lands are located, with full power to enter into the contract and to collect by assessment and levy against the lands of the district the amount of the contract obligation.

SEC. 3. That upon the execution of any contract between the United States and any irrigation district pursuant to this act the public lands included within such irrigation district, when subject to entry, and entered lands within such irrigation district, for which no final certificates shall have been issued and which may be designated by the Secretary of the Interior in said contract, shall be subject to all the provisions of the act entitled "An act to promote the reclamation of arid lands," approved August 11, 1916: *Provided*, That no map or plan as required by section 3 of the said act need be filed by the irrigation district for approval by the Secretary of the Interior.

That the term "first mortgage," as used in section 12 of the Federal Farm Loan Act, approved July 17, 1916, shall be construed to include mortgages on farm lands under United States reclamation projects, notwithstanding there may be against such lands a reserved or created lien in favor of the United States for construction or other charges as provided in the act of June 17, 1902, and acts amendatory thereof and supplementary thereto, known as the reclamation law: *Provided*, That such lands are otherwise eligible for loans under the Federal Farm Loan Act: *And provided further*, That the amount and date of maturity of such lien shall be given due consideration in fixing the value of such lands for loan purposes.

—Ottamar Hamelt.

South African Engineer Completes Reclamation Studies.

Mr. William Godfrey Sutton, the South African engineer who has spent the past ten months visiting and studying construction problems on a number of our projects, returned recently to his home. It will be recalled that Mr. Sutton came to the United States for the purpose of gaining technical experience in actual construction work on the projects of the Reclamation Service, at the request of the director of irrigation, Union of South Africa. Mr. Sutton's work was performed under a scholarship from the South African Government, at no expense to the Reclamation Service. He has written recently to Director Davis as follows:

105758—22—2

I am afraid that I found no time to settle down and write to you during the brief interval between leaving Washington and boarding the ship at New York.

After my rather busy life during the last few months the change to the quiet life on board ship gives me time to reflect upon events and recall many memories of my stay with the Reclamation Service in America.

My first feelings are of gratitude to you and your staff for the kindly interest you have taken in my endeavors and for the generous assistance and courtesy which have enabled me to reap the fullest benefit and derive the maximum pleasure from my stay with you in the United States.

It is my hope that this letter may convey to you some idea of the gratitude I feel to all who have helped me during my studies and travels in America.

In this connection I should like to record my regards for the assistance and services rendered me by many private irrigation companies and my appreciation of the privilege of being able to enjoy the hospitality of so many of the American people.

In conclusion I should be glad if you would convey an expression of my thanks to the Secretary of the Interior through whose courtesy this generous hospitality and these liberal facilities were made available.

It has been a pleasure to all with whom Mr. Sutton came in contact to meet and be associated with this talented and enthusiastic engineer, who has left us with feelings of regret at his departure but with a keener interest in the problems of his country.

Recent Reclamation Service Orders and Announcements.

CIRCULAR LETTERS.

Nos.

1102. Economies.
1103. Anniversary number of the Reclamation Record commemorating 20 years of reclamation.
1104. List of vessels of the United States Reclamation Service.
1105. Economies, Rio Grande project.
1106. Motor trucks available.
1107. Field inspection of applicants for relief from payment of charges.
1108. Contracts providing for payment of operation and maintenance charges.
1109. Disposition of old records (see C. L. 1078).
1110. Leases or purchases of real estate.
1111. Water charges due from Reclamation Service employees.
1112. Cooperation between project organizations and county agents.

GENERAL LETTERS.

211. Organization sheets for fiscal year 1923.
212. Abstract of bids for Government Advertiser.
213. Water delivery records.
214. Lubrication of internal-combustion engines on excavating machines.

ADMINISTRATIVE AND STATISTICAL PROGRESS REPORTS FOR APRIL, 1922.

Monthly conditions of principal Reclamation Service reservoirs for April, 1922.

[Elevation above sea level.]

State and project.	Reservoir.	Available capacity in acre-feet.	Elevation.		Storage in acre-feet.			Out-flow in acre-feet.	Elevation of water surface		
			Spill-way crest. ¹	Lowest gate sill. ²	Beginning of month.	End of month.	Maximum.		Beginning of month.	End of month.	Maximum.
Arizona, Salt River.....	Roosevelt ³	1,305,000	2103	1903	963,970	1,024,885	1,024,885	.....	2101.14	2105.4	2105.1
California, Orland.....	East Park.....	51,000	1199.68	1111.68	48,590	50,100	50,100	2,500	1198.35	1199.2	1199.2
Idaho:											
Boise.....	Arrowrock.....	280,000	3211	2956	128,000	228,600	228,600	138,500	3148.5	3193.7	3193.7
	Deer Flat.....	177,000	2518	2483	137,500	177,000	177,000	6,000	2513.6	2518	2518
Minidoka.....	Lake Wolcott.....	95,180	4245	4236	86,920	88,200	88,200	422,752	4244.29	4244.4	4244.4
	Jackson Lake.....	847,000	6769	6730	337,970	361,540	361,540	.....	6747.5	6748.58	6748.58
Montana:											
Milk River.....	Nelson.....	38,500	2216	2200	17,840	35,640	35,640	.....	2208.83	2215.21	2215.21
St. Mary storage.....	Sherburne.....	66,000	4788	4720	.....	.....	.....	.....	.....	.....	.....
Sun River.....	Willow Creek.....	16,700	4130	4085	8,831	9,811	9,811	.....	4120.9	4122.2	4122.2
Nebraska-Wyoming, North Platte.											
	Pathfinder.....	1,070,000	5852	5670	682,260	602,870	802,870	2,450	5831.35	5838.68	5838.68
	Lake Alice.....	11,400	4182	4159	3,968	3,343	3,968	.....	4170.3	4169	4170.3
	Lake Miniatara.....	60,766	4125	4074	51,394	50,992	51,394	.....	4120.5	4120.3	4120.5
Nevada, Newlands.....											
	Lake Tahoe.....	120,000	6220	6224	.....	.....	.....	6,886	6225.28	6225.24	6225.28
	Lahontan.....	290,000	4162	4060	216,100	232,760	232,760	14,136	4155.6	4157.6	4157.6
New Mexico:											
Carlsbad.....	McMillan.....	45,000	3267.7	3241.6	31,000	21,000	31,000	16,000	3265.2	3262.8	3265.2
Rio Grande.....	Elephant Butte.....	2,638,860	4407	4231.5	1,771,247	1,716,049	1,771,247	111,853	4382.45	4380.7	4382.45
Oregon, Umatilla.....	Cold Springs.....	50,000	621.5	560	44,550	49,100	49,450	4,136	617.83	620.91	621.14
Oregon-California, Klamath.....	Clear Lake.....	462,000	4540	4514	352,000	430,000	430,000	.....	4555.74	4038.8	4038.8
South Dakota, Belle Fourche.....	Belle Fourche.....	205,000	2975	2920	125,750	158,380	158,380	.....	2964	2968.9	2968.9
Utah, Strawberry Valley.....	Strawberry.....	250,000	7558	7517	221,200	232,000	232,000	.....	7554	7555.5	7555.5
Washington:											
Okanogan.....	Conecouilly.....	14,400	2290	2232	2,912	3,200	3,200	329	2258.7	2259.8	2259.8
Yakima.....	Bumping Lake.....	34,000	3426	3389	2,280	3,355	3,355	.....	3392.6	3394.2	3394.2
	Lake Cle Elum.....	22,800	2134	2122	24,355	26,870	27,100	.....	2134.1	2135.2	2135.3
	Lake Kachess.....	210,000	2258	2192	187,854	201,120	201,120	.....	2250.3	2253.4	2253.4
	Lake Keechelus.....	152,000	2515	2425	115,880	119,090	119,090	.....	2499.4	2500.9	2500.9
Wyoming, Shoshone.....	Shoshone.....	456,600	5360	5132.3	399,760	409,590	409,590	16,877	5351.1	5352.7	5352.7

¹ Or maximum storage.

² Or zero storage.

³ Zero water depth at elevation 1902.2.

⁴ Amount of silt shown by silt survey deducted from original capacity.

⁵ Proposed regulation.

⁶ Estimated low-water limit under proposed plan of regulation.

⁷ Elevation of reservoir raised 12 inches by stop logs in spillway.

SALT RIVER PROJECT, ARIZONA.

Water was run in all of the canals during April. The demand for irrigation water service is steadily increasing.

There were five crews in the field during the month. With a daily average of 89 man days and 8½ stock days, the following maintenance work was accomplished; Main Canal cleaned, miles, 18; laterals cleaned, miles, 70½; old structures repaired, 67; linear feet stake and brush bank built, 374; cubic yards dirt fill placed, 330½; cubic yards concrete placed (repairs), 4½; cubic yards dirt excavated, 19; zanjero house well repaired, 1.

In addition to the above maintenance work, the Ruth dredger, with a daily average of 4 man days and 4 stock days, bermed 77,490 linear feet of the East Branch of Consolidated Canal, and built 7 miles of road on the desert side of the canal.

The P. & H. one-half yard excavator, with a daily average of four-fifths man days, bermed and removed silt from the bottom of the Western Canal, for a distance of 630 feet.

The following construction work was accomplished with a daily average of 50 man days and 3½ stock days: Cubic yards concrete placed, 45; feet 18-inch concrete pipe installed, 68; feet 24-inch concrete pipe

installed, 650; feet 18-inch corrugated iron pipe installed, 42; feet 24-inch corrugated iron pipe installed, 50; feet 30-inch corrugated iron pipe installed, 25; cubic yards dirt excavated, 314; cubic yards dirt fill placed, 509; concrete turnout built, 1; redwood turnout built, 1; miles new irrigation ditch completed, ¾; miles new irrigation ditch 60 per cent completed, 1½; miles waste ditch completed, 3½; miles waste ditch 50 per cent completed, 1½; miles waste ditch 90 per cent completed, 2½; new well sites fenced, 2; standard sill and stringer bridges built, 13; miles fence moved and replaced, 2.

The pump house construction crew continued work during the month, and with a daily average of 4½ man days, accomplished the following work: Curb at McQueen wells, concrete (25 cubic yards muck hoisted 30 feet, 12½ cubic yards concrete placed), 1; baffles placed in Highline Canal gates, 2; new pump houses completed, except painting, 8; new pump houses one coat paint applied, 13; new pump houses two coats paint applied, 1; old pump houses one coat paint applied, 4; pump house foundation changed from upper to underground discharge, 1.

Work was continued on widening the Eastern Canal, and with an average of 17.6 man days and 2 stock days, the following work was performed: The Monaghan, 2-yard dragline, excavated 11,296 cubic yards;

the Lidgerwood, 1½-yard dragline, excavated 9,687 cubic yards.

The total power generated during April was 7,424,980 kwh. The Roosevelt plant operated continuously, generating 4,579,000 kwh. The Cross Cut plant also operated continuously and generated 1,673,100 kwh. The South Consolidated plant operated 98.4 per cent of the month with a total output of 469,400 kwh. The Arizona Falls plant operated 99.9 per cent and generated 357,300 kwh., and the Chandler plant operated 88 per cent of the month with a total output of 346,180 kwh.

The drilling of 23 new drainage wells has been completed; 2 wells were completed during April. The drilling of 3 other wells is under way.

Three-fourths mile of 11,000-volt line was constructed to connect up plant to be installed at 12 E-S½ N.

Marinette substation.—This work was completed with the exception of the completion of the assembly of the 11,000-volt lightning arrester, which is held up pending the arrival from the factory of missing parts.

The 11,000-volt line from Marinette substation to the junction with the Agua Fria line was overhauled, and No. 2 copper installed in place of the No. 6 copper.

The guying of towers on the Roosevelt-Mesa transmission line was about 90 per cent completed at the end of the month.—*C. C. Cragin.*

YUMA PROJECT, ARIZONA—CALIFORNIA.

April temperatures were below normal, causing some damage to young cotton. The demand for irrigation water was light as most of the cotton was planted during March, and alfalfa stands were being turned to seed. The price of alfalfa hay was \$20 a ton up to the 15th of the month when it dropped to \$15, and at the close of the month was \$12.

The 30-B-Bucyrus completed the recent work on the South Drain on April 26. During the month the machine advanced 1.10 miles, excavating 7,000 cubic yards of material. On the North Drain the type 14 Bucyrus advanced 4,500 feet, excavating 13,500 cubic yards of material.

On the Valley Division Ruth dredges Nos. 7, 8, and 9 cleaned 17½ miles of lateral excavating 26,800 cubic yards of silt. On the Reservation Division Ruth No. 6 cleaned 4½ miles of lateral, excavating 6,000 cubic yards.

The maximum discharge of the Colorado River was 30,500 second-feet, minimum 13,300 second-feet, total for the month, 1,138,000 acre-feet. On April 30 the discharge was 30,500 second-feet with the gauge height 20.6.—*Porter J. Preston.*

MESA DIVISION, YUMA PROJECT.

April weather conditions for construction work on the Yuma Mesa were good except for a few windy days which made it disagreeable to lay concrete pipe; 9,544 linear feet of lock-joint pipe were laid, a number of concrete turnout basins were cast, and steel gates installed.

The concrete pipe manufacturing plant was closed down on April 25, the present program of construction being completed. From March 1, 1921, to April 25, 1922, 41,008 linear feet of lock-joint concrete pipe were cast, in sizes ranging from 18 to 45 inches inside diameter.

During the month a small pumping unit was installed in the B Lift Pumping Plant. This consists of

a 16-inch D. S. split-case horizontal pump mounted on 15-inch steel base direct connected through a flexible coupling to an 8-pole 200-horsepower induction motor. The pump was manufactured by the Krogh Pump Machinery Company and the motor by the General Electric Company. On April 16 a picnic to celebrate the delivery of water to the Yuma Mesa was given under the auspices of the Yuma Chamber of Commerce at the B Lift Pumping Plant. Speeches were made by Col. B. F. Fly, Project Manager Porter J. Preston, Wm. Wisener, President of the Yuma County Water Users' Association, Hon. H. B. Wilkinson, Gov. Lugo of Baja, Calif., Gov. Campbell of Arizona, and Judge J. H. Westover.—*Porter J. Preston.*

ORLAND PROJECT, CALIFORNIA.

April weather at Orland was characterized by cool temperatures and a predominance of north wind which retarded crop growth considerably and which has resulted in the season being about one month later than normal. The cutting of the first crop of alfalfa was only partially started at the close of the month and owing to the cool weather the yield will be less than the normal first crop.

Regular water deliveries were begun early in the month and continued without interruption, 16,700 acre feet being delivered to 10,000 acres irrigated. The water used was applied mostly on alfalfa. Storage at East Park reservoir was 50,100 acre feet at the close of the month with all the flashboards in place on the spillway crest. The melting of snow has made the flow of both Stony and Little Stony Creeks well sustained. A small maintenance force was engaged in cleaning laterals and repairing concrete lining. Concrete lining work was suspended for the season and the construction force disbanded on April 11, 6,173 square yards of lining being placed during the month, making a total of 101,297 square yards for the season.

Diamond drilling at Millsite was continued during the month. Field work in connection with the detailed topographic survey of the dam site was completed and field work on the reservoir topographic survey resumed.—*R. C. E. Weber.*

GRAND VALLEY PROJECT, COLORADO.

The weather during April was colder than normal with a deficiency of precipitation. Temperatures as low as 17° were experienced in parts of the valley on the 18th, but on account of the backwardness of the season none of the crops were far enough advanced to be damaged, except a small percentage of the apricots. Although the late spring prevented the farmers from getting in their crops as early as usual, most of them had their land in good shape and much of the planting of spring crops had been completed. There is a large increase in the potato acreage on the project this season and a large acreage had also been planted to grain crops. The acreage of sugar beets will apparently be about the same as last season. There was a better demand for alfalfa and farmers near town were getting as high as \$12 a ton in the stack.

The irrigation system was operated continuously during the month, but the demand for water was light and only a small acreage was irrigated. The Price-Stub pumping plant was also operated continuously. The principal maintenance work consisted of the construction of a timber crib to protect the buildings and canal bank below the diversion dam from anticipated

high water. Two small maintenance crews were employed on burning weeds, cleaning laterals, and repairing minor structures.

On the drainage construction the P. & H. $\frac{1}{2}$ -yard dragline was operated 22 shifts and Monighan 1-yard machine was operated 20 shifts on the H and M drains. Twenty-eight hundred and twenty linear feet of drain were completed, involving 9,700 cubic yards of excavation. Considerable work was accomplished on maintenance of open drains, burning weeds, and deepening by sluicing where necessary. One field party was employed part time on investigation of seeped areas.

Confirmatory proceedings in the district court for the authorization of the contract with the Orchard Mesa Irrigation District were set for hearing on May 1.—*S. O. Harper.*

UNCOMPAGHRE PROJECT, COLORADO.

Work was continued on the excavation and installation of structures on several laterals that have been taken over for operation by the service. The uncollected water rentals at the end of the month for the season 1921 amounted to approximately \$15,000, \$8,000 being collected during the month. The total cash collections to April 30, 1922, on account of water rentals for the season 1922 amounted to \$13,949.34. The demand for irrigation water was particularly heavy on the lower end of the project, and all the project canals and laterals carried a flow for irrigation purposes during the entire month.

The Gunnison Tunnel was opened on April 7 at which time 300 second-feet were turned in to reinforce the flow of the Uncompaghere River. An additional flow of 100 second-feet was turned in on April 8, and this flow was maintained almost continuously until the latter part of the month, when the tunnel flow was reduced to 300 second-feet. The tunnel water was shut off for three days from April 15 to 17, inclusive, after the South Canal had been thoroughly cleaned, in order to inspect this canal and also the tunnel, and make the necessary repairs to cracks and weak sections in the concrete lining.

The failure of one flume sheet in the Big Sandy wash flume on the C. Q. lateral on April 28, undermined the lower concrete approach, and as a result this lateral was shut down for two and one-half days to permit the construction of a temporary wooden flume 32 feet long.

The P. & H. dragline completed the cleaning and repairs to the sliding sections of the M. & D. canal main line between M. P. 9.5 and the headworks. In doing this cleaning work, the machine removed one rock culvert from under the main line of the canal near M. P. 9, which culvert has during past years been a constant menace to the safe operation of the canal. The dike section about one-half mile below the Montrose and Delta headworks was enlarged and ripped by the dragline in order to prevent possible damage to the main line of the canal, and the Logan lateral on account of flood waters in the Uncompaghere River. The dragline also cleaned the canal section below the headworks on April 29 and 30, which work required the operation of the machine for three and one-half continuous shifts. Much work was involved during the month in keeping the canals and laterals free from weeds which were blown in by the numerous wind storms that occurred.

Public notice announcing a construction charge of \$70 per acre for land on this project was promulgated

by the Secretary of the Interior on April 12.—*L. J. Foster.*

BOISE PROJECT, IDAHO.

April weather was not favorable for plant growth except the last week of the month.

Building, highway work, sawmill operations, and the farms provided work for a large number of men. By the latter part of the month there were few unemployed.

The seeding of small grain and planting of early potatoes was completed. The acreage of the latter crop was greatly increased this season. Sheep shearing was nearly completed. Heavy losses in sheep were reported from some sections, due to cold rains which occurred immediately after shearing. The irrigation of pastures and meadows began the latter part of the month but the demand for water was light.

Cool weather retarded the melting of snow in the mountains. The run-off was slightly below normal but was far in excess of the amount required to fill the reservoirs and for irrigation. The filling of Deer Flat Reservoir was completed and Arrowrock Reservoir lacked only 50,000 acre feet of having its full capacity. In addition, a large amount of water was wasted down the Boise River. There is still a large amount of snow in the mountains and the indications are that there will be a heavy run-off when the weather turns warm.

Water was run through the Main Canal during the entire month for supplying Deer Flat Reservoir and for the small amount of irrigation that was under way in the upper portion of the project. The canal system below Deer Flat Reservoir was in operation during the latter part of the month, but there was little demand for irrigation water. Two small breaks occurred on the Deer Flat Lowline Canal, due to gophers. The damage caused was slight. Canal cleaning was completed, weeds were burned, and minor structures repaired.

The construction of the Greenleaf and Drew drains was continued in the Wilder territory. Good progress was made. The drains have now reached the water-logged areas, which have been spreading very fast during the past year.

Test borings were discontinued at Black Canyon diversion site on the Payette River on April 20. Surveys and ground-water investigations were continued on the water-logged areas under the Arrowrock Division. Minor surveys were made for farm laterals and replacement of small structures in the completed portion of the project.

Practically all of the old crop of hay has been disposed of. Although the price received was very low, there is a feeling that better prices will prevail for this year's crop. Good prices were being received for this year's wool clip. In all lines of trade the outlook is brighter and the feeling more optimistic than prevailed during the past year.—*J. B. Bond.*

KING HILL PROJECT, IDAHO.

April weather was favorable for outside work. One killing frost was recorded on the 7th.

Construction forces built up one concrete drop of 9-foot vertical fall in the main canal extension at Station 1+59; 135 second-feet of water is perfectly cared for by the structure. The wood-stave barrel for Big Alkali flume was erected, which completes this structure. Work remaining on the concrete structures for the Hammitt siphon were completed and

65 per cent of the pipe line backfilled by the P & H 206 dragline; 2,298 cubic yards of backfill was handled by the machine at a cost of 6.2 cents per yard. The dragline, working two shifts per day, began excavation of the 9-A lateral on the 12th and removed 3,550 cubic yards of class 2 material at a cost of 25 cents per yard, which work performed by men and teams would have cost not less than \$1 per yard. Teams excavated 3,277 cubic yards of class 1 material on the 7-E lateral at a cost of 21.5 cents. This lateral was 90 per cent excavated at the end of the month. Work of repairing the Slick siphon was begun on the 18th and at the end of the month about 85 per cent of the repairs contemplated at this time had been completed. The Hafer wood-pipe siphon was repaired and put in first-class condition by the addition of wooden collars on the pipe. These repairs were made necessary by inefficient maintenance by the district during previous years and a few wooden collars placed from time to time as minor leaks appeared would have obviated an expenditure of upwards of \$2,000.

A maintenance crew of six men and one truck were engaged throughout the month installing weirs and turnouts and repairing lateral structures. Water was turned into the system on the 1st for the purpose of priming canals and structures. Owing to the late season little water had been delivered. The first delivery was requested on the 22d; 89 per cent of the 1921 operation and maintenance charges had been collected.

Most of the crops were planted and spraying of orchards was in progress.

Cattle and sheep were all on range. Shearing was about 50 per cent completed. One shipment of 400,000 pounds of wool was made from the project at 31 cents per pound.—*Walter Ward.*

MINIDOKA PROJECT, IDAHO.

The weather during April was mostly cool and wet, and such that farm work was greatly delayed.

At Burley nearly 200 applications for relief were received under the terms of the act extending the time of payment of water charges on Government projects.

There was one interruption to service at the power house during the month. This was prearranged and lasted for 15 minutes. It was the first time since December 2, 1921, that an interruption to service has occurred.

At American Falls, surveys of right of way across the Indian Reservation were continued. A large map of the proposed reservoir district was completed and a revised list of lands included in the district was prepared. The force employed at American Falls was materially reduced.—*Barry Dibble.*

HUNTLEY PROJECT, MONTANA.

Weather conditions during April were detrimental to extensive field operations and the main work was limited to that which could be readily reached from the hard surfaced roads. The principal work done was that of replacing damaged trap boxes and cleaning small laterals that can not be cleaned with the small Ruth dredger.

Some work was done on the main canal above Huntley in removing silt and gravel beds which had washed in during heavy rains last summer. The Austin drag line continued work cleaning on the main canal extension and one team outfit was employed in similar work on the reservoir line canal below Fly Creek Syphon.

All agricultural work was late and little seeding had been done. Much of the land will remain too wet for some time yet to permit satisfactory working. Alfalfa and fall wheat were doing nicely. No irrigation will be required until about June 1 or later.—*G. H. Bolt.*

Prevailing crop prices at close of April, 1922.

Project.	Alfalfa hay, per ton.		Barley, per bushel.	Oats, per bushel.	Wheat, per bushel.	Potatoes, per bushel.
	In stack.	Baled at shipping point.				
Salt River.....	\$7.50-\$8	\$11.50-\$12	\$0.80	\$0.53	\$1.47	\$4.82
Yuma.....	7.00	12.00				3.60
Orland.....	8.00	12.00	.63		1.23	
Grand Valley..	6-12	10-15		.60	1.10	.60
Uncompahgre..	5-10		.63	.42	1.02	.60
Boise.....	4.00	8.00	.60	.60	.90	.42
King Hill.....	7.50	9.00				
Minidoka.....	4.00	7.00	.63	.42	.99	.75
Huntley.....						
Milk River.....	10.00	12-14	.77	.48	1.33	1.20
Sun River.....	10.00	15.00	.85	.80	1.32	1.00
Lower Yellowstone..	15-20		.65	.50	1.42	1.00
North Platte..	7.00		.35	.30	.80	.50
Newlands.....	7.00	11.00	.95	.75	1.25	1.00
Carlsbad.....		20.00				
Rio Grande.....						
North Dakota pumping.....	15-18		.41	.40	1.39	1.00
Umatilla.....	14.00	18.00				
Klamath.....	7-9		.60	.40	1.05	
Belle Fourche..	10.00	14.00	.53	.37	1.25	1.25
Strawberry Valley.....	8-9	11-12	.70	.50	1.05	.48
Okanogan.....	12.00					1.20
Yakima.....		15.00				.66
Riverton.....						
Shoshone.....	10.00	13.00		.50	1.15	.60
Indian projects:						
Blackfoot.....	20.00		.96	.64	1.30	
Flathead.....	15.00	18.50		.58	1.24	.60
Fort Peck.....					1.40	1.00

¹ New Crop.

MILK RIVER PROJECT, MONTANA.

April weather was backward and unfavorable for construction, maintenance, and farming operation. Labor supply was in general sufficient with a material reduction in wages as compared with 1921.

The Dodson South Canal was in commission from the 3d, delivering 19,600 acre-feet into Nelson Reservoir, 60 acre-feet to the Great Northern Railway at Bowdoin, and a small amount to farmers. Maintenance work consisted of painting flume trestle on the NS 9-66 at Saco, repairing blow-out in Dodson North Canal, and general preparations for the operation season. The Ruth ditch cleaner was put in commission on the Dodson North Lateral the latter part of the month.

Contractor for Nelson Reservoir enlargement resumed work on the 3d and made fair progress; three small earthwork contractors resumed work during the month but made only poor progress, and the contractor for buildings at Dodson Dam completed his work.

Construction of flume at Station 1095 on the Nelson Reservoir Canal was continued nearly to completion.—*Geo. E. Stratton.*

ST. MARY STORAGE.

Abnormally cold weather continued nearly the whole month of April. There were several severe storms, and conditions were such that little construction or maintenance work could be done to advantage.

Maintenance work consisted of a small amount of excavation in preparation for putting in two new sections with expansion joint in St. Mary Crossing pressure pipe, a small amount of repair work on Spider Coulee Flume, and a little other structure and canal repair work. Surveys and engineering work consisted of that necessary in connection with the maintenance work being done, and work of a routine nature.

The flow of St. Mary River and its tributaries was at a low stage until nearly the end of the month when a heavy rain caused considerable run-off. The snow in the drainage basin was comparatively heavy and the indications were that the spring run-off would be large. The indications were that labor was plentiful, although few laborers were employed.—*R. M. Snell.*

SUN RIVER PROJECT, MONTANA.

Stormy weather during April interfered with outside work. Three of the earthwork contractors on Part 2 of Greenfields Division worked a part of the month and moved about 7,800 cubic yards of earth.

Cleaning of laterals and installation of a few distribution structures on the Fort Shaw Division and the repairs to Willow Creek discharge structure were begun. Repairs to telephone lines were in progress.

Two field parties worked on farm unit surveys and cross-sectioning of laterals on Greenfields Division, Part 2.

Carload shipments from the project were as follows: From Fort Shaw, 14 cars of hay, 1 of sheep; from Simms, 4 of hay; from Fairfield, 4 of wheat; total, 18 of hay, 4 of wheat, 1 of sheep.—*Geo. O. Sanford.*

LOWER YELLOWSTONE PROJECT, MONTANA—NORTH DAKOTA.

April was unfavorable for construction and maintenance work and for farming operations.

In spite of the small amount of precipitation the soil was in good condition for seed germination.

Owing to frost, construction work under contract 864, started May 1, could not be carried on. Contractors Beauchaine and Klug, under contract 878, owing to the unfavorable weather and bad roads, were able to construct only 12 bridges, all of which were in the vicinity of Fairview and near favorable roads. Owing to the frozen material, contractors Beauchaine and Klug could not start concreting on the main canal check at mile 6.8 until April 21. Excavation for five main canal turnouts under Schedule 1 of this contract was completed. The construction of the Thomas Point Pumping Plant by Government forces was carried on under unfavorable weather conditions, and during the month the following was accomplished: 600 cubic yards of dirt moved; 968 linear feet of piling driven; 135 cubic yards of concrete placed; 7,000 pounds of reinforcing steel placed.

Three hundred and fifty yards of sand and gravel were screened and delivered at the mixing plant. The pumping plant at the end of the month was estimated

Crop report, Fort Shaw Division, Sun River project, Montana, 1921.¹

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	5,446	Ton.....	9,793.15	1.80	\$6.00	\$58,758	\$10.78
Alfalfa seed.....	92	Bushel.....	76.2	.83	12.00	914	9.94
Barley.....	126	do.....	1,939	15.33	.50	970	7.66
Clover hay.....	35	Ton.....	34	.97	5.00	170	4.86
Clover seed.....	84	Bushel.....	325.4	3.85	8.00	2,603	30.81
Corn, Indian.....	48	do.....	1,117.5	23.04	.60	670	13.82
Garden.....	54	do.....			100.00	5,400	100.00
Hay ¹	128	Ton.....	113.0	.88	5.42	613	4.79
Oats.....	461	Bushel.....	11,415.3	24.76	.50	5,708	12.38
Pasture.....	869	Acre.....			4.51	3,922	4.51
Potatoes.....	217	Bushel.....	26,639.0	122.76	.80	21,312	98.21
Wheat.....	1,126	do.....	17,496.2	15.53	.90	15,750	13.98
Miscellaneous ²	14	do.....				652	46.57
Total cropped.....	8,700	Total and average.....				117,440	13.49
Number of acres irrigated on 208 farms.....	8,880						
Town sites.....	22						
Miscellaneous.....	8						
Total irrigated.....	8,910						
			Areas.	Acres.	Farms.	Per cent of project.	
Total irrigable area farms reported.....				12,072	208	84.65	
Total irrigable area farms reported less seep, etc.....				9,968	208	69.90	
Total irrigated area farms reported:							
Under water-right applications.....				8,728	203	61.20	
Under rental contracts.....				18	1	.13	
Under vested water rights.....				134	4	.94	
Total cropped area farms reported.....				8,700	208	61.04	

¹ Four units farmed "dry" reported 30 acres of alfalfa, \$120; 5 acres of oats, \$40; 10 acres of pasture, \$50; 60 acres of wheat, \$756.

² Other than alfalfa and clover.

³ Beans, corn fodder, small fruit, rye, cabbage.

to be about one-third completed physically; it is 60 per cent completed, based on cost.

The removing of rust and scale from the main canal structures was practically completed at the end of the month. Owing to the cold weather it was not possible to do any painting of these structures. One concrete check was placed at the head of lateral KK-2. Seven new main canal pipe turnouts in the vicinity of Sidney were nearly completed. Miscellaneous maintenance work consisted of completing the program of cutting brush and willows, repairing the wooden flume on Lateral G. and placing a pipe culvert on Lateral G near the extreme end.

The water in the Yellowstone River was at a low stage during the month. From reports received, high water can be expected during June, although not so high as the maximum.—*L. H. Mitchell.*

NEWLANDS PROJECT, NEVADA.

April weather was favorable for maintenance work but the first 20 days were too cold for satisfactory crop growth.

The Truckee and T Canals were operated throughout the month. The V Canal was in operation commencing April 3. Little water was used for irrigation until the last week.

Lateral cleaning operations by Government forces covered 3½ miles of laterals in various districts.

Satisfactory progress was made on excavation of deep drains with seven dragline excavators in operation on the Kent Lake, Lower Soda Lake, Harmon, Carson Lake, L. Hazen, and Fernley drains. Approximately 206,000 cubic yards of material were removed. Drain structures involving over 60,000 ft. B. M. of lumber were installed.

Important conferences were held in Reno and Carson City, Nev., April 17, 18, 19 between representatives of the Reclamation Service, Governor Boyle, the State Engineer of Nevada and the Nevada Valleys Power Co. relative to conflict of power filings on Truckee

River with development of storage in Spanish Springs Reservoir.

Regular and special elections were held by the Truckee-Carson irrigation district on April 4. Directors Swingle, Holmes, Harmon, and Kent were re-elected. The vote on the question of entering into a contract with the United States for the settlement of the controversy concerning the operation and maintenance of deficit resulted 359 votes in favor and 91 votes against the measure, more than the necessary two-thirds vote being recorded in favor of the contract.—*John F. Richardson.*

(Crop report on p. 108.)

CARLSBAD PROJECT, NEW MEXICO.

Water was in the canal during the entire month of April except for a few days at the close, when it was turned out because of heavy rainfall. A total of 10,230 acre-feet was delivered to the farms. Maintenance work consisted of general repairs and cleaning open drain ditches B and D and in the selection of several small drops in Lateral No. 13, and general repairs to the paving on the water slope of Avalon Dam. Some repair work was also necessary just below the circular spillway at Avalon, on the south end of the structure.

The total discharge of the Pecos River at the Dayton station amounted to 8,170 acre-feet; the river was low until about the 25th, when local rains increased the discharge to about 325 second-feet. A very intense local rain with considerable hail fell at Avalon Reservoir on the 23d; the reservoir rose 2.1 feet in one and one-half hours. The water practically all came directly into Avalon Reservoir from Dagger Draw and other small arroyos on the east side. The next day after the storm drifts of hail from 4 to 6 feet deep were found in the draws on the east side of the reservoir. There was no run-off from the west side of the drainage area during this storm.

The regular planting season for cotton commenced about April 10. On the 23d heavy rains fell generally

Crop report, Greenfields Division, Sun River project, Montana, 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	922	Ton.....	1,764	1.9	\$7.00	\$12,348	\$13.39
Alfalfa seed.....	69	Bushel.....	39	.6	12.00	448	6.78
Barley.....	139	do.....	2,413	17.4	.50	1,206	8.68
Clover hay.....	25	Ton.....	17	.7	6.00	102	4.08
Flax.....	17	Bushel.....	130	7.6	1.35	175	10.32
Garden.....	12				112.00	1,400	112.00
Hay ¹	463	Ton.....	399.5	.9	7.19	2,870	6.20
Oats.....	965	Bushel.....	22,838	23.7	.50	11,420	11.83
Pasture.....	160				2.79	444	2.79
Potatoes.....	79	Bushel.....	8,697	110.1	.90	7,827	99.70
Wheat.....	9,524	do.....	149,250	15.7	.90	134,325	14.10
Miscellaneous ²	15					355	23.66
Total cropped.....	12,390	Total and average.....				172,940	13.96
Number of acres irrigated on 169 farms.....	12,840	Areas.			Acres.	Farms.	Per cent of contracts.
Total irrigated.....	12,840						
		Total irrigable area farms reported.....			19,420	169	100
		Total irrigated area farms reported, under rental contracts.....			12,840	169	66.13
		Total cropped area farms reported.....			12,390	169	63.80

¹ Other than alfalfa and clover.

² Beans, clover seed, corn fodder, sunflowers.

Crop report, Newlands project, Nevada, 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average (per acre).	Per unit of yield.	Total.	Per acre.
Alfalfa.....	28,294	Ton.....	95,561	3.37	\$10.00	\$955,610	¹ \$33.78
Barley.....	732	Bushel.....	19,385	26.48	.55	10,660	¹ 14.56
Cantaloupes.....	129					14,692	¹ 113.89
Garden and miscellaneous crops.....	1,448					40,328	¹ 27.85
Oats.....	90	Bushel.....	3,000	50.00	.48	1,440	¹ 24.00
Potatoes.....	484	do.....	93,067	192.28	1.20	111,650	¹ 230.74
Wheat.....	2,443	do.....	66,867	27.37	.90	60,180	¹ 24.63
Hay (grain).....	247	Ton.....	289	1.17	10.00	2,890	11.70
Alfalfa (seeded 1921).....	2,923	do.....	268		10.00	2,680	11.70
Pasture (wildgrass).....	7,574					20,925	2.65
Pasture (alfalfa after cutting).....						33,495	
Less duplicated areas.....	1,194						
Acreage in full production ¹	33,590					1,194,590	¹ 35.57
Total cropped.....	43,440	Total and average.....				1,254,580	28.88
		Areas.....			Acres.....	Farms.....	Per cent of project.
Acreage irrigated without crop.....	2,721	Total irrigable area farms reported.....			70,650	788	44.43
Total irrigated.....	46,160	Total irrigated area farms reported.....			46,160	788	29.02
		Total cropped area farms reported.....			43,440	788	27.31

¹ Crops in full production.*Crop report, Rio Grande project, New Mexico-Texas, including Picacho, Island, Tornillo, and Fort Hancock districts, 1921.*

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average (per acre.)	Per unit of yield.	Total.	Per acre.
Alfalfa.....	29,919	Ton.....	90,902	3.038	\$13.76	\$1,251,356	\$41.82
Alfalfa seed.....	477	Pound.....	49,472	103.7	.067	3,353	7.02
Apples.....	242	do.....	146,690	604.9	.055	8,103	33.48
Barley.....	649	Bushel.....	9,686	14.9	.73	7,074	10.89
Beans.....	790	do.....	12,029	15.2	2.455	29,537	37.43
Cane.....	1,387	Ton.....	4,342	3.13	7.02	30,497	21.97
Cantaloupes.....	980	Crate.....	313,408	319.6	.256	80,377	82.00
Chili.....	72	Pound.....	57,340	789	.084	4,867	66.97
Corn fodder.....	2,108	Ton.....	3,917	1.85	3.86	15,120	7.17
Corn, Indian.....	14,406	Bushel.....	295,573	20.51	.716	211,725	14.69
Corn, sorghum.....	281	do.....	4,681	16.6	.756	3,541	12.57
Corn, cane.....	200	Ton.....	990	4.9	4.73	4,645	23.22
Cotton.....	4,318	Pound.....	1,315,210	304.6	.196	257,885	59.73
Cotton seed.....	224	do.....	153,702	686.1	.014	2,160	9.64
Fruits, small.....	82	do.....	48,270	585.09	.11	5,320	64.86
Garden.....	2,475					153,162	61.90
Hay.....		Ton.....	2,188	1.4	7.935	17,363	11.11
Oats.....	992	Bushel.....	27,268	27.5	.837	22,834	23.01
Onions.....	136	Pound.....	656,247	4,834	.02	15,749	116.01
Pasture.....	6,785					67,255	9.91
Peaches.....	80	Pound.....	75,725	938	.057	4,375	54.07
Pears.....	454	do.....	325,799	718.4	.05	16,622	36.65
Peas.....	21	do.....	34,323	1,634	.03	1,050	50.00
Potatoes, sweet.....	671	do.....	3,817,740	5,687	.019	75,825	112.95
Rye.....	2	Bushel.....	30	15	1.33	40	20.00
Tomatoes.....	14	Pound.....	27,385	1,932	.028	776	54.76
Watermelon.....	212	do.....	631,760	2,968	.01	6,987	32.83
Wheat.....	9,995	Bushel.....	144,515	14.5	1.187	171,584	17.16
Flowers.....	59	Acre.....				5,878	100.06
Miscellaneous.....	373					18,650	50.02
Less duplicated area.....	2,306						
Total cropped.....	77,660	Total and average.....				2,493,710	32.13
Nonbearing orchard.....	444						
Young alfalfa.....	270						
Irrigated, no crops.....	7,206						
Total irrigated.....	85,580						

over the project and cotton planting was suspended. About 75 per cent of the crop was planted during the period, a large acreage of which will have to be re-planted, owing to excessive rainfall packing the ground over the seed.—*L. E. Foster.*

RIO GRANDE PROJECT, NEW MEXICO-TEXAS.

Construction work on drains and laterals continued in the Leasburg, Mesilla, and El Paso Divisions, on a somewhat reduced program, however. In the Mesilla Division three dragline excavators, consisting of two Bucyrus 9½ and one P. & H. 206 were employed on drainage construction, a total of four shifts, moving 103,800 cubic yards from 2 miles of drain. Five machines, consisting of two Ruth ditching machines, one Bucyrus 9½, one Monaghan 2-T, and one P. & H. 206 draglines, each working one shift, were engaged primarily on lateral work; 43,800 yards were placed in 2.8 miles of laterals by the draglines, and two Ruth machines removed 16,500 cubic yards from 6½ miles of lateral. Two small laterals were under construction by team crew, and 55 minor structures were installed on both drains and laterals. In the El Paso Division drainage construction progressed with the operation of only one dragline excavator, a Bucyrus 9½ operating one shift on the Border Drain, excavating 22,200 cubic yards. During the first half of the month two draglines, one Bucyrus 9½ and one Bucyrus 60-B, were employed on drain cleaning, and both of these machines have been moved to drainage construction, the 60-B to resume the construction of the Tornillo Drain where the contract machine left off, and the other to continue construction of the River Drain toward San Elizario. A force account team crew which has been employed on lateral reconstruction has been discontinued. Thirty minor structures and two major culverts were installed on drains and laterals.

Water for irrigation was delivered throughout the month with a decrease in storage of 55,197 acre-feet. Sand had not yet given any trouble, and sluicing operations were still removing the accumulations from the canals, although there had been a slight increase in the amount of sand carried in the river with the increased flow.

Frost on the 10th and 18th destroyed practically all the fruit crop with the exception of apples and about 50 per cent of the pear crop.—*L. M. Lawson.*

NORTH DAKOTA PUMPING PROJECT.

Field work was not begun in April. The plan was to push all maintenance work in May in the interest of reduction of expense.

The power plant was operated for commercial power contract. The load dropped off about 10 per cent from the same month of last year; 78,550 kilowatt-hours of electrical energy were delivered to Williston as compared with 84,500 last year. The results are favorable, however, as the rates remain the same as last year, and costs are somewhat lower.

Mine rates were reduced, effective April 1, the average reduction being about 25 per cent. About 900 tons of coal were mined.

The Williston Creamery, burned down last October, has been rebuilt and was opened for business.—*Wm. S. Arthur.*

UMATILLA PROJECT, OREGON.

The Umatilla River was in flood most of April. Warmer weather melted the snow on the foothills; there is enough snow in the mountains to give a favor-

able outlook for a late run-off. The Hermiston Drain was discharging 30 second-feet at the end of the month, an increase of 6 second-feet from the minimum discharge.

The farmers were planting potatoes and gardens and seeding alfalfa. During the latter part of the month irrigation of crops was in full swing.

The Feed Canal was operated throughout the month; 10,217 acre-feet were delivered to Cold Springs Reservoir. The distribution system was practically in full operation at the end of the month; 4,136 acre-feet were delivered to A line from the reservoir. The peak storage was reached on the 17th, with 49,450 acre-feet.

East Division—During the month 148 cubic yards of concrete lining were placed on D Lateral and on the Maxwell to C cut-offs. Thirty-two cubic yards of reinforced concrete were placed in collars on the 20-inch wood pipe on G Lateral and 2,000 cubic yards of material was excavated in exposing the pipe joints. Eight minor structures were built, containing a total of 14 cubic yards of concrete. At the end of the month both D and G Laterals, upon which extensive betterments were being made, were ready for running water.—*H. M. Schilling.*

KLAMATH PROJECT, OREGON-CALIFORNIA.

During the first half of April the weather was generally unfavorable for farming and construction operations. Spring plowing was not begun in earnest until after April 15. The season was about 20 to 30 days later than usual.

A large number of sheep and cattle were wintered on the project farms. Owing to the late season practically all of the stock was held on the project until the last week in April when it began to move slowly to the ranges. Practically all of the 1921 hay crop and a large part of the carry over from 1920 had been disposed of. As the winter and spring advanced and it became apparent that late feeding would be necessary, the price of hay advanced from \$5 to \$7 and \$8 per ton.

The Diversion Canal was operated at capacity all month diverting flood water from Lost River to the Klamath River; about 20,000 acre-feet were carried during the month. All streams tributary to the project were in moderate flood. Water started to spill to Tule Lake on March 25; to April 30, about 60,000 acre-feet had entered Tule Lake. Water for priming purposes was turned into the Main Canal on April 23 and turned out again the next day on account of a break.

On the precast flume job, work was resumed on asphaltting and grouting the joints. Ten small crews were engaged from the 10th to the 30th in cleaning ditches and in general repair work.

On the C Canal enlargement, 18,255 cubic yards of class 2 material were excavated; this work was about 60 per cent complete. On the J Canal, 48,658 cubic yards of material were excavated and on the J Lateral system 3,634 cubic yards. The above construction was done with dragline excavators.—*Herbert D. Newell.*

BELLE FOURCHE PROJECT, SOUTH DAKOTA.

April weather was generally unsettled, with frequent light rains that were accompanied by snow flurries and low temperatures. A heavy rain of 1.6 inches occurred on the 6th and resulted in considerable delay to spring farm work, but produced excellent moisture

conditions for germination. Precipitation was 45 per cent above normal and roads remained in very poor condition for nearly the entire month.

Farm operations proceeded under difficulties and interruptions by the weather. Seeding of small grains on the sandy soils was about completed, but the heavy clays required drying weather for good progress. Alfalfa and some early sown grain fields were green, but vegetation had made practically no growth because of continued cold weather. The season was more backward than for several years.

The Feeder Canal delivered 24,154 acre-feet to the reservoir, which was the heaviest flow for the past two years. No water was diverted for direct irrigation. Inflow from other sources resulted in a total accretion of 32,630 acre-feet for the month and filled the reservoir to elevation 2,968.9, or 6 feet below the spillway crest.

Maintenance work was carried on under unfavorable conditions but it was expected the canals would be ready for irrigation by May 10. The Indian Creek Flume was overhauled and about 2,000 feet of lumber used in replacing decayed timbers. A concrete chute 380 feet long was constructed in the Indian Creek sub-lateral at Mile 22.6. Two worn-out wood linings on the Johnston Lateral were abandoned by changing the alignment and constructing a new ditch back from the bench line. The upper portion of the Dennis Siphon, where alternate wetting and drying had caused decay in the wood staves, was removed and replaced with concrete pipe. About 30 minor wooden structures such as farm turnouts and drops were placed in repair.

On April 6 this office was notified that construction work on the project would be discontinued, and arrangements were made immediately to effect a cor-

responding reduction in the organization. The office force was occupied largely in compiling data and considering applications filed under the relief act.—*F. C. Youngblutt.*

STRAWBERRY VALLEY PROJECT, UTAH.

April weather was unusually cold and unseasonable with abnormal precipitation. The fore part of the month was unfavorable for farming operations owing to excessive rainfall; the latter part was clear and favorable for plowing and sowing crops.

The price of cereals and hay remained about the same as during the previous month. As very little of these commodities were on hand, few shipments were made.

The usual spring cleaning of the power canal was accomplished during the month and the canal put in shape for carrying water during the present irrigation season.

The power plant was in continuous operation throughout the month and power furnished under contract to the several project towns which consumed a total of 84,762 kilowatt hours.

Practically no irrigation water was used during the month by any of the canal systems under the project because of copious rains. The run-off of the Spanish Fork River began about the 25th and at the end of the month was discharging 800 second-feet.

A committee, consisting of President Lee R. Taylor, Secretary A. R. Wilson, and Director A. T. Money, representing the Strawberry Water Users' Association, left for Washington on April 25 to attend a congressional hearing on May 2 relative to Strawberry Valley grazing lands.—*W. L. Whittemore.*

Crop report, Belle Fourche project, South Dakota, 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average (per acre.)	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	25,829	Ton.....	43,238	1.7	\$5.00	\$216,190	\$8.37
Alfalfa seed.....	1,810	Bushel.....	1,208	.7	12.00	14,496	8.01
Barley.....	1,423	do.....	18,850	13.2	.40	7,540	5.30
Beans.....	19	do.....	184	9.7	2.50	460	24.21
Beets, sugar.....	926	Ton.....	10,256	11.1	5.50	56,408	60.92
Clover seed, sweet.....	200	Bushel.....	1,110	5.6	2.00	2,220	11.10
Corn.....	5,622	do.....	110,420	19.6	.50	55,210	9.82
Corn fodder.....	375	Ton.....	309	.8	5.00	1,545	4.12
Flax seed.....	153	Bushel.....	200	1.3	1.25	250	1.63
Garden.....	159					8,940	56.22
Hay, native.....	940	Ton.....	701	.7	6.00	4,206	4.47
Hay, grain.....	855	do.....	851	1.0	4.00	3,404	3.98
Oats.....	5,390	Bushel.....	88,600	16.4	.32	28,352	5.26
Pasture.....	7,352					36,760	5.00
Potatoes.....	238	Bushel.....	27,616	116.0	1.00	27,616	116.00
Wheat.....	5,341	do.....	54,880	10.3	.90	49,293	9.23
Miscellaneous.....	48					860	17.92
Less duplicated areas.....	1,580						
Total cropped.....	55,100	Total and average.....				513,750	9.32
Total irrigated.....	55,100						
		Areas.	Acres.	Number of farms.	Per cent of project.		
		Total irrigable area farms reported.....	73,197	1,033		94	
		Total irrigated area farms reported under water right applications.....	55,100	983		70	
		Total cropped area farms reported.....	55,100	983		70	

¹ Includes 0.50 per ton for beet top.

² Includes value of corn stalks.

³ Based on present irrigable area of project.

OKANOGAN PROJECT, WASHINGTON.

April weather was very cold.

The mechanical force was engaged in finishing repairs to machinery at Robinson Flat substation, completing the necessary repairs at power plant No. 1, and repairing concreting machinery, automobiles, and trucks. The maintenance crew had been in the field since about the 10th of the month cleaning laterals and repairing structures. Supplemental construction was started by the necessary surveying for concrete lining, and on the 10th a small crew was started in the preparation of laterals for lining and the hauling of aggregate. At the end of the month a portion of the lateral system which it is proposed to line was ready for the lining to be placed. The latter part of the month was spent by a small crew in digging holes and erecting poles for the transmission lines to be built to Duck Lake and the Government wells.—*Calvin Casteel.*

YAKIMA PROJECT, WASHINGTON.

Sunnyside Division.—April 15 marked the beginning of the irrigation season, there being no demand for water prior to that date as the farmers were delayed in their regular spring work by the continued cool weather. From the 15th to the 30th, however, the demand for water increased rapidly, and by the end of the month delivery was being made to all parts of the division. Maintenance work consisted principally of cleaning laterals, repairing structures, paint-

ing steel flumes, and riprapping canal banks where sloughing had occurred due to severe freezing during the winter.

Tieton Division.—The first delivery of water for irrigation was on the 21st. Flow of water through the entire length of the main canal began on the 23d, when 25 second-feet were diverted from the river to supplement the supply from Cowiche Creek. At the close of the month diversion from the river had been increased to 85 second-feet, with 16 second-feet from North Fork and 15 second-feet from South Fork of Cowiche Creek. The sublaterals were thoroughly cleaned this spring, as the time allowed for this work was extended on account of the late season and consequent postponement of irrigation demands. The large snowslide about 1 mile above Tieton Tunnel was successfully removed by using a small flow of water and several shots of dynamite to loosen the ice. No damage was done to the concrete section of the canal. Maintenance crews were engaged on replacement of wooden structures with concrete, installation of concrete head walls with steel gates on turnouts along the first 3 miles of Lateral G, and miscellaneous repairs. Erection of 2,000 linear feet of 30-inch and 36-inch wood-stave flume, and installation of approximately 4,400 linear feet of 8-inch, 10-inch, and 12-inch wood-stave pipe to replace wood flunfe on Laterals B and C 8.73, respectively, were completed.

Storage reservoirs.—At Keechelus the gates remained closed throughout the month, except from the

Crop report, Strawberry Valley project, Utah, 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	11,080	Ton.....	35,743	3.2	\$10.00	\$357,430	\$32
Apples.....	60	Pound.....	424,100	7,068.3	.025	10,602	177
Barley.....	218	Bushel.....	10,331	47.4	.55	5,682	26
Beets (sugar).....	5,180	Ton.....	55,380	10.7	5.50	304,590	57
Clover hay.....	210	do.....	334	1.6	10.00	3,340	16
Clover seed.....	76	Bushel.....	356	4.7	5.00	1,780	23
Corn fodder.....	86	Ton.....	929	10.8	5.00	4,645	54
Corn, Indian.....	213	Bushel.....	5,288	24.8	.60	3,173	15
Corn (ensilage).....	135	Ton.....	1,902	14.1	6.00	11,412	85
Cherries.....	13	Pound.....	49,820	3,832	.07	3,487	268
Fruits (small).....	23	do.....	22,630	984	.12	2,716	118
Garden.....	140					14,030	102
Hay.....	435	Ton.....	879	2.0	10.00	8,790	20
Melons.....	35					4,110	117
Oats.....	1,252	Bushel.....	53,906	43.1	.45	24,258	19
Pasture.....	3,615					12,600	3
Peaches.....	186	Pound.....	2,040,667	10,971	.03	61,220	829
Pears.....	2	do.....	27,500	13,750	.03	825	412
Potatoes.....	300	Bushel.....	40,223	134.1	.80	32,178	107
Tomatoes.....	6	do.....	1,020	170	.75	765	127
Wheat.....	7,400	do.....	202,701	27.4	.75	152,025	21
Waste and crop failure.....	710						
Miscellaneous.....	5					932	186
Total cropped.....	31,380	Total and average.....				1,020,590	32.52
Summer fallow.....	121						
Young alfalfa.....	990						
Non-bearing orchard.....	9						
Total irrigated.....	32,500						
		Areas.....			Acres.....	Farms.....	Per cent of project.
		Total irrigable area farms reported.....			33,000	2,400	100
		Total irrigated area farms reported.....			32,500		98
		Under water-right applications—					
		Private.....			25,000		76
		Special.....			8,600		26
		Total cropped area farms reported.....			31,380	2,400	95

¹Artichokes, pop corn, onions.

6th to the 8th, when the lake was lowered 2 feet to accelerate breaking up of ice. At Kachess and Cle Elum the gates were closed, and at Bumping they were open throughout the month.

New divisions.—Work was continued on plans and estimates for the Roza Division. Summation of costs by miles had proceeded to Mile 12 by the end of the month.—*J. L. Lytel.*

TIETON DAM.

Four hundred men were employed on the Tieton Dam at the end of April and rapid progress was being made in working up to a schedule for the summer's work. Weather conditions, while causing no actual delays, were marked by rain and cold heavy winds, not favorable for the most efficient work. Concrete was poured in the core wall up to elevation 2,735,

bringing it 25 feet above the natural river bed and permitting the hydraulicling of material for embankment dumped from trestles near both toes of the dam. Steam shovels began excavating in the barrow pits about April 20, and at the end of the month were furnishing about 3,500 cubic yards per day to be hydraulicled into place in the dam embankment. The 10-ton cableway over the core wall was about completed. A concrete plant was being erected under the cableway for future core-wall work. Prior to starting the embankment, the river section above the core wall was stripped and cleaned up with the steam shovels. Considerable hand stripping was done in the steep hillsides.

The principal work for May will be in placing embankment. It is expected to place an average of 5,000 cubic yards per day for the rest of the summer.—*F. T. Crowe.*

Comparison between operation and maintenance estimates and results, January 1 to April 30, 1922.

Projects.	Gross costs.				Net accruals and revenues.				Area for which water is available (acres).
	Estimate for 1922.		Actual cost to Apr. 30.	Amount *over or under.	Estimate for 1922.		Actual returns to Apr. 30.	Amount more or *less than estimate.	
	Total for year.	To Apr. 30.			Total for year.	To Apr. 30.			
UNDER PUBLIC NOTICE.									
Belle Fourche.....	\$70,000	\$11,000	\$11,500	*\$500	\$101,153				82,500
Boise.....	290,000	82,000	61,000	21,000	290,000	\$12,000	\$12,000		167,300
Carlsbad.....	52,000	16,000	14,500	1,500	56,625	14,000	12,300	*\$1,700	25,000
Huntley.....	45,000	13,500	10,300	3,200	46,500				30,000
King Hill.....	35,500	5,600	7,600	*2,000	35,500	5,600	7,600	2,000	16,900
Klamath.....	55,000	19,000	5,000	14,000	55,000	19,000	5,000	*14,000	51,000
Lower Yellowstone.....	36,000	6,000	3,200	2,800	36,000	6,000	3,200	*2,800	40,200
Minidoka (south side).....	94,000	26,000	16,000	10,000	95,300				49,000
Newlands.....	105,000	40,000	55,000	*15,000	121,000	20,000	20,000		72,200
North Dakota pumping.....	35,000	6,500	5,300	1,200	30,820				7,650
North Platte (Interstate).....	165,000	50,000	49,000	1,000	166,700	2,000	2,000		*130,000
Okanogan.....	37,000	10,000	8,000	2,000	53,720	26,720	24,720	*2,000	8,460
Orland.....	35,000	12,000	8,000	4,000	35,230	6,000	6,000		20,500
Rio Grande.....	231,000	115,000	114,000	1,000	233,945	117,945	116,945	*1,000	116,000
Shoshone.....	70,000	16,000	15,000	1,000	75,750	700		*700	71,100
Strawberry Valley.....	25,000	8,200	7,200	1,000	52,500	600	800	*200	59,100
Sun River (Fort Shaw).....	14,000	4,600	2,130	2,470	15,600				13,900
Umatilla.....	37,280	11,400	10,500	900	37,280	11,400	10,500	*900	24,400
Yakima:									
Sunnyside.....	130,000	43,000	46,500	*3,500	148,776	24,000	20,500	*3,500	103,000
Tieton.....	84,000	30,000	30,000		89,800	2,000	2,000		32,000
Yuma.....	260,000	65,000	65,000		262,000	90,000	72,000	*18,000	63,200
Total.....	1,905,780	590,800	544,730	46,070	2,039,199	357,965	315,565	*42,400	1,183,410
UNDER WATER RENTAL.									
Grand Valley.....	50,000	16,000	13,000	3,000	50,800	3,500	4,000	500	38,400
Milk River (including St. Mary).....	71,500	18,000	10,300	7,700	22,000	1,300	800	*500	*74,000
North Platte (Fort La Ramie).....	70,000	20,000	12,500	7,500	53,000	3,700	3,700		43,400
Sun River (Greenfields and Big Coulee).....	25,000	3,600	2,620	980	30,000				28,500
Uncompahgre.....	135,000	50,000	54,400	*4,400	142,500	30,000	17,000	*13,000	100,000
Total.....	351,500	107,600	92,820	14,780	298,300	38,500	25,500	*13,000	284,300
INDIAN.									
Blackfeet.....	30,000	4,000	1,750	2,250	(?)	(?)	(?)	(?)	21,500
Flathead.....	69,740	(8)	(8)	(8)	(?)	(?)	(?)	(?)	105,000
Fort Peck.....	14,600	(8)	(8)	(8)	(?)	(?)	(?)	(?)	22,400
Total.....	114,340								148,900

¹ Assumed same as estimate. Actual returns not given by project.

² Returns regulated by district contract.

³ Includes 17,000 acres for which water is carried in main canal.

⁴ Not including tunnel repairs.

⁵ Includes installment of \$25,000 for tunnel repairs.

⁶ Stored water is furnished through the St. Mary Canal for 21,500 acres additional.

⁷ Announcement of charges not yet received.

⁸ Operation and maintenance chart not received from project.

RIVERTON PROJECT, WYOMING.

April weather was unfavorable for construction. The roads were in very poor condition throughout the month and practically impassable for about half the month. The flow of Wind River was about normal and the snow storage on the watershed is in excess of normal.

Dragline 121474 was employed on the Second Division, Wyoming Canal, moving 15,484 cubic yards, about one-half of which was sandstone.

On the Wind River Diversion Dam dragline 121322 was employed screening gravel. A total of 558 cubic yards of concrete was placed in the headworks piers, retaining wall, logway, and foreapron. Excavation of cut-off trenches was continued by hand.

On the dike at the diversion dam dragline 121323 stripped 2,709 cubic yards from the like site and loaded 10,010 cubic yards on wagons for the embankment. The work on the dike was greatly hampered by a soft condition of the ground at the site.

One survey party was employed on topographic surveys.—*H. D. Comstock.*

SHOSHONE PROJECT, WYOMING.

April was a cold and backward month. Planting of crops was in progress.

A small crew continued on power plant and transmission line construction. Work advanced during the month so that Unit No. 2 was tested out April 18–20. The transmission line, Powell substation, and the city of Powell electric distribution systems were tested out on the 21st and the plant was put into regular service on that date, beginning with the town of Powell load.

On the Frannie Division dragline excavation on Drain 105 was renewed on the 3d and on Drain 109 system on April 25. Work on the electrification of the class 9½ steam Bucyrus dragline began April 24. Mr. H. Downer completed his contract for minor lateral system extension earthwork on April 4.

On the Garland Division no dragline excavation was in progress during the month, but two machines are in readiness for operation. Twenty-six minor structures were erected in connection with open drain construction and a small amount of rock excavation on the Drain X system was also carried on.

A class 14 gas Bucyrus engaged on Garland Division drainage during the season of 1921 began moving to the Willwood Division on April 18. This machine will be used on Willwood damsite and canal excavation after electrification at the site of the work. En route to this new work the machine excavated approximately 4,600 cubic yards of earthwork on the approaches to the proposed Willwood bridge south of Powell. The crossing of Shoshone River was made without trouble and without the use of pontoons.

Maintenance work was in progress during the entire month. The principal work was cleaning ditches; 30 miles of ditch were cleaned, of which work 5 miles were done by a Ruth dredger in the Frannie Division. This machine was recently transferred from the Huntley Project. It was placed in operation on the 4th and has given satisfactory service. Water was turned into the canal system from the Shoshone River on the 28th, but no deliveries therefrom were made, owing to rain on the 29th. On the Frannie Division a small head was turned into lateral D-56 from Sage Creek on the 17th for domestic and stock use.

Reports from local sources and the U. S. Weather Bureau indicate a large snow storage in the mountains

at the head of the Shoshone River and a year of high run-off is expected. The Shoshone River flow began to increase on the 5th and has been rising slowly but steadily since that date.

The letter ballot on supplemental construction of the Frannie Division for drainage construction closed on April 15. Of 354 water users entitled to vote 226 voted for the charge, 46 voted against the charge, and 29 ballots were disqualified on account of irregularities.—*J. S. Longwell.*

INDIAN PROJECTS, MONTANA.

BLACKFEET PROJECT.

The weather conditions were such during April that scarcely any construction or maintenance work could be done to advantage, and at the end of the month little seeding had been done. The weather was cold with several severe storms.

Construction work was confined to placing a few minor timber structures. Maintenance work was confined to repairing structures, cleaning laterals, and making repairs to canal banks. Engineering work consisted of making surveys of several structure sites on the location of the proposed Four Horns Reservoir Outlet Canal, making estimates in connection with this work, and general routine engineering.

The flow in the reservation streams was at a low stage nearly the entire month. The spring run-off commenced later than usual but the snows are comparatively heavy in the headwaters of the streams indicating a probable heavy run-off later.

At the end of the month there was more moisture in the ground than has been the case for several years, indicating that there will be no necessity for irrigating to give all the crops a start.—*R. M. Snell.*

FLATHEAD PROJECT.

April weather conditions were generally unfavorable for construction work until the latter part of the month.

Farming operations all over the project became very active after the middle of the month. The moisture in the ground was much greater than usual, and the prospect of a good crop year was encouraging the seeding of a larger acreage than usual this season to both grain and hay crops.

On the Dry Creek Canal lining, subcontractors set up camp and made ready for work in May.

Moving of the *Bucyrus* steam shovel began at the end of the month. This shovel will be repaired and moved to Tabor Reservoir to begin the excavation of the Tabor Feed Canal. Miscellaneous work on laterals was carried on the last half of the month, using farmers with teams. All of the operation and maintenance camps opened and began maintenance work with a small force. The irrigation system appears in good condition with less maintenance work needed than usual.

A party of about 50 prospective land buyers arrived April 22 and spent several days looking over the project lands.

Considerable hay was shipped into the country from the Yakima and Deer Lodge Valleys. The local supply of hay was practically exhausted. Alfalfa hay in the stack sold for from \$15 to \$20 a ton. The condition of live stock improved greatly at the end of the month on account of the rapid growth of grass on the pastures and ranges.—*C. J. Moody.*

FORT PECK PROJECT.

April opened auspiciously, but cool weather, showers, and a 3-inch snowfall greatly delayed outdoor work, so that it was not until the 20th that cars could travel and farmers get to work in the fields.

Several warm days early in the month melted the snow very rapidly and an unusually heavy run-off occurred from all major streams running into the Missouri River from the north. The first mile of Big Porcupine Canal was severely damaged and a section of embankment was washed out at Poplar Diversion Dam. Repairs to both were under way and should be completed before irrigation water is needed. Little damage to distributaries resulted from cross-drainage run-off, as the snow on the lower areas had melted gradually earlier in the season.

Crop conditions, as to moisture, were good. Live stock on the range was in poor condition, as grass was short owing to the late spring.—S. A. Kerr.

GENERAL OFFICES.

Washington office.—Director Davis returned on April 10 from his western trip, largely in connection with the meetings of the Colorado River Commission, and was in the office for the balance of the month. During his absence the office was in charge of Assistant Director Bien as acting director. Chief Counsel Hamel was in the office the entire month.

On April 11 the director was instructed by Secretary Fall to transfer to Washington the administrative and most of the other functions of the Denver office and to establish a purchasing office either in Denver or Chicago; immediate steps were taken to

put these instructions into effect. In this connection Chief Engineer Weymouth left for Washington on April 29 to confer with the director on plans for the proposed change.

Action was taken by the Secretary on the following matters, among others, submitted to him:

Recommending approval of public notice announcing a construction charge of \$70 per acre against the irrigable lands of the Uncompahgre project and requiring payment to begin on December 1, 1922; approved April 12.

Recommending approval of public notice announcing operation and maintenance charges on Part 1, Yuma Mesa Division, Yuma project; approved April 17.

Recommending approval of public notice opening to entry 33 public land farm units on June 16 on the Newlands project, and fixing the construction charge at \$80 per irrigable acre; approved April 18.

Recommending the amendment of the public notice fixing the operation and maintenance charge on the Sun River project at \$1.35 per irrigable acre for the season of 1922 instead of \$1.50 as previously announced; approved May 1.

Recommending execution of a contract with the city of Los Angeles providing for continuing investigations in Boulder and Black Canyon dam sites, \$75,000 to be supplied by the city; approved April 19.

Recommending approval of a draft of contract, as to form, for the purpose of negotiating with the Shasta View Irrigation District and other districts and interests representing 8,500 acres to be reached by pumping under the Klamath project; approved April 24.

Corrected page proof of the Boulder Canyon report, which will be issued shortly as Senate Docu-

Consolidated statement of cash investment and capital funds to April 30, 1922.

	Current month.		Balances.	Subtotal.	Totals.
	Debit.	Credit.			
Cash:					
With Treasurer, United States Reclamation Fund.....		\$77,136.15	\$2,459,444.41		
With Treasurer, United States, unadjusted.....			246.08		
With special fiscal agents, Reclamation Fund.....	\$880,341.68	924,251.88	592,038.00	\$3,051,728.49	
With Treasurer, United States, Yuma auxiliary fund.....	19,341.18		85,891.49		
With special fiscal agents, Yuma auxiliary fund.....	43,576.96	60,209.42	40,969.40	126,860.98	
With Treasurer, United States, drainage and cut-over funds.....			205.93		\$3,178,795.40
Investment:					
Disbursements, all funds.....	559,921.27		170,827,883.19		
Transfer vouchers received.....	51,382.08		9,167,291.86	179,995,175.05	
Less—					
Collection vouchers.....		424,322.65	41,233,366.36		
Transfer vouchers issued.....		51,382.08	9,167,291.86	150,400,658.22	
Project net investment.....					129,594,516.83
					132,773,312.23
Capital fund:					
Sales of public lands.....			104,103,714.24		
Sales of reclamation town sites.....			557,129.04	104,660,843.28	
Proceeds potassium rent and royalties.....			14,856.47	14,856.47	
Proceeds oil leasing act, past production.....			3,977,849.31		
Proceeds oil leasing act, future production.....			2,129,740.55	6,107,589.86	110,783,289.61
Judgments, Court of Claims.....			550,347.58	550,347.58	
Net increase of compensation fund.....	491.43	17,752.42	2,153,552.85	2,153,552.85	2,703,900.43
Rio Grande Dam appropriation.....			1,000,000.00		
Drainage and cut-over appropriation.....			100,000.00	1,100,000.00	1,100,000.00
Sales of Yuma auxiliary lands.....			61,122.19	61,122.19	61,122.19
Bond loan.....			20,000,000.00		
Less repayments.....			1,875,000.00	18,125,000.00	18,125,000.00
	1,555,054.60	1,555,054.60			132,773,312.23

¹ Contra.

ment No. 142, was returned to the printer at the close of the month.

During the month 107 purchase orders were placed and 12 advertisements issued. Purchases amounted to \$4,138.60. The storehouse filled 259 requisitions and made 31 sales from stock, the total value amounting to \$2,407.09.

Publications issued during the month comprised 97 copies of the annual report and 556 miscellaneous reports and papers. The 24 mimeographed jobs amounted to a total run of 11,000 sheets.

The settlement and information section answered 511 inquiries concerning the service and opportunities on the projects. At the end of the month the total number of inquiries from ex-service men concerning opportunities on the land amounted to 193,090.

The photographic laboratory turned out work during the month to the value of \$243, distributed as follows: Washington office, \$39.75; field, \$203.25.

Among the visitors to the office during the month were Olof Fredholm, Swedish Government engineer, who is studying drainage work and plans to visit the Rio Grande, Yuma, Newlands, Grand Valley, and North Platte projects; W. G. Sutton, engineer from the Reclamation Service of the South African Government, on his return home after spending ten months on a number of the projects; and T. C. Yager, of Coachella Valley, Calif.

Denver office.—The chief engineer, together with Designing Engineer J. L. Savage and Engineer E. B. Debler, left Denver on April 13 for Reno, Nev., to confer with Governor Boyle and other State officials relative to Spanish Springs matters. The chief engineer returned on April 22, and left for Washington, D. C., on the 29th. Assistant Chief Engineer Chas. P. Williams returned to Denver on April 28 from an extended visit to Montana projects. Engineer James Munn left Denver on April 8 and during the month visited the Rio Grande, Yuma, and Klamath projects. Drainage Engineer Burkholder visited Albuquerque, N. Mex., to confer with the Rio Grande Valley Survey Commission in reference to the investigations being carried on there. He later visited the Shoshone project in reference to drainage matters.

The principal work accomplished in the Designing Section during the month consisted of the following: Started final designs for Black Rock Canyon diversion dam, Boise project; completed preliminary design and estimate for three heights of dams for detention reservoirs at Black Canyon, Colorado River storage project; began studies preparatory to making paper location of proposed drains, Middle Rio Grande (secondary) project. Prepared detail designs for siphon at station 235, Wyoming Canal, transition lines to earth canal, culvert under Wyoming Canal, drop at cross drainage and culvert under Wyoming Canal; also, prepared preliminary design and estimate for dam at Midwest Draw, estimate for radial gate equipment at Pilot Butte reservoir, and preliminary design and estimate for dike across draw, Wyoming Canal—all Riverton project. Partially prepared detail design for Wyoming Dam, Shoshone project; revised previous estimate for Spanish Springs Reservoir, Newlands project; completed and forwarded concrete drawings for Tieton spillway, Yakima project. Under standardization, there were prepared designs for metal forms for Wendelken interlocking conduit units in sizes of 24-inch, 30-inch, and 36-inch spans; tracings were made for Wendelken interlocking concrete culvert units in sizes of 18-inch to 48-inch spans and,

also, of concrete turnout units in the same size. Continued computations of weights of standard devices.

The principal work accomplished in the Electrical Division consisted of the following: Completed preliminary studies of the Pilot Butte power plant, Riverton project. Tentative general arrangement of the needle valve outlets for the Tieton Dam, Yakima project, was prepared; progress was made in the general design of the 60 and 24-inch needle valves for this dam; remote electric control devices for these valves are being studied. General design for the outlet works for Hubbard Dam, Flathead project were under consideration. The 24-inch needle valve being designed for the Tieton Dam can probably be used on the Hubbard Dam. Studies were in progress at the end of the month to determine the amount of firm power available at Black Canyon with 24,000,000 acre-foot reservoir.

In the Cost and Property Section, arrangements were made for the transfer of about \$1,000 worth of equipment and supplies.

Among the more important matters considered in the Legal Section during the month were the proposed method of assignment to El Paso County Water Improvement District No. 1 of Texas of delinquent water rental accounts; the form of application to be made by water users for relief under the act of March 31, 1922; proposed public notice for the Uncompahgre project; report on tentative decree Truckee-Carson adjudication, Newlands project; proposed contract with Fort Shaw Irrigation District, Sun River project; proposed contract with Lower Milk River Water Users' Association and the proposed irrigation district, Milk River project; proposed contract with the Belle Fourche Water Users' Association and proposed irrigation district, Belle Fourche project.—*R. F. Walter.*

Statistics Concerning Newlands Project Dairy Herds.

Importations of dairy cattle into the Newlands project during the past year, amounting to approximately 1,000 head, plus the natural increase of the present herds, have increased the dairy cow population from 2,072 at the end of 1920 to 3,658 at the end of 1921. Prior to 1921 the largest number of dairy cattle on the project was in 1915. The number in 1921, however, represents a 41 per cent increase over the 1915 figure. The dairy cattle population at the end of 1921 represents an increase of 76 per cent over that of 1920. The natural increase for 1922 should be materially larger than during the past year. This, together with the probability that there will be heavy importations of cattle from other sections, should bring the dairy population to a point where the marketing of alfalfa hay out of the project will be a matter of much less concern than in the recent past.

In 1920 the number of Newlands project farmers having from 10 to 20 dairy cows amounted to 5.6 per cent. At the end of 1921 the number had increased to 11.6 per cent, or an increase in the number of these foresighted farmers of 100 per cent.

ADMINISTRATIVE ORGANIZATION.

DEPARTMENT OF THE INTERIOR.

Hon. ALBERT B. FALL, Secretary of the Interior.
 EDWARD C. FINNEY, First Assistant Secretary.
 FRANCIS M. GOODWIN, Assistant Secretary.
 EDWIN S. BOOTH, Solicitor for the Interior Department.
 CHARLES V. SAFFORD, Administrative Assistant to the Secretary.
 HARRY G. CLUNN, Private Secretary to the Secretary.
 JOHN HARVEY, Chief Clerk and Superintendent of Buildings.

U. S. RECLAMATION SERVICE.

WASHINGTON, D. C.

Arthur Powell Davis, director; Morris Blen, assistant director; Ottamar Hamele, chief counsel; J. B. Beadle, director's assistant; C. J. Blanchard, statistician; Hugh A. Brown, editor and office assistant; C. A. Bissell, engineer; C. A. Lyman, acting chief accountant; Miss H. A. Fellows and Raymond Depue, fiscal agents; C. H. Fitch, chief clerk; Emmet Carr, purchasing agent; G. W. Numbers, appointment clerk; H. N. Bickel, Yakima, Wash., W. A. Meyer, Denver, Colo., and W. F. Kubach, Great Falls, Mont., examiners of accounts.

DENVER, COLO.

F. E. Weymouth, chief engineer, Tramway Building, Denver, Colo.; R. F. Walter and C. P. Williams, assistant chief engineers; Miss L. H. McIsel, secretary to the chief engineer; J. M. Gaylord, electrical engineer; J. L. Savage, designing engineer; James Munn, engineer; J. L. Burkholder, drainage engineer; J. M. Luney, chief clerk; A. McD. Brooks, purchasing agent; Harry Caden, fiscal agent.

FIELD LEGAL OFFICES.

Boise, Idaho.—B. E. Stoutemyer, district counsel. Projects: Boise, Minidoka, King Hill, and Jackson Lake Enlargement; R. M. Patrick, district counsel, located at American Falls, Idaho.

Denver, Colo.—Law section office of chief engineer: Armand Offutt, district counsel.

El Paso, Tex.—P. W. Dent, district counsel. Projects: Rio Grande, Carlsbad, and Hondo.

Las Cruces, N. Mex.—Mark B. Thompson, attorney in charge of litigation on Rio Grande and Carlsbad projects.

Helena, Mont.—E. E. Roddis, district counsel, Helena, Mont. Projects: Blackfeet, Flathead, Fort Peck, Huntley, Milk River, St. Mary Storage, Sun River, North Dakota Pumping, Lower Yellowstone, and Shoshone.

Mitchell, Nebr.—J. N. Beardslee, district counsel. Projects: North Platte, Belle Fourche, and Riverton.

Montrose, Colo.—J. R. Alexander, district counsel. Projects: Grand Valley, Uncompahgre, and Strawberry Valley.

Portland, Oreg.—H. L. Holgate and D. G. Tyree, district counsel. Projects: Yakima, Okanogan, Umatilla, and Klamath.

San Francisco, Calif.—Henry A. Cox and Brooks Fullerton, district counsel, 349 Pacific Building. Projects: Salt River, Yuma, Orland, and Newlands.

PROJECT ORGANIZATION.

Belle Fourche Project.—B. E. Hayden, project manager, Newell, S. Dak.; R. C. Walber, chief clerk; August Lewin, fiscal agent.

Boise Project.—J. B. Bond, project manager, Boise, Idaho; E. R. Mills, chief clerk; C. F. Weinkauff, fiscal agent.

Carlsbad Project.—L. E. Foster, project manager, Carlsbad, N. Mex.; V. L. Minter, chief clerk and fiscal agent.

Grand Valley Project.—S. O. Harper, project manager, Grand Junction, Colo.; G. H. Young, chief clerk; A. H. Hall, fiscal agent.

Huntley Project.—A. R. McGinness, project manager, Ballantine, Mont.; G. H. Bolt, chief clerk; Miss M. C. Simek, fiscal agent.

King Hill Project.—Walter Ward, project manager, King Hill, Idaho; T. W. Hause, chief clerk; L. D. Eakin, fiscal agent.

Klamath Project.—H. D. Newell, project manager, Klamath Falls, Oreg.; N. G. Wheeler, chief clerk; G. R. Barnhart, fiscal agent.

Lower Yellowstone Project.—L. H. Mitchell, project manager, Savage, Mont.; C. A. Denman, chief clerk.

Milk River Project.—G. E. Stratton, project manager, Malta, Mont.; H. A. Parker, engineer; E. E. Chabot, chief clerk; G. S. Moore, fiscal agent.

Minidoka Project.—Barry Dibble, project manager, Burley, Idaho; Dana Templin, engineer; E. C. Diehl, chief clerk; Miss A. J. Larson, fiscal agent; F. A. Banks, engineer, American Falls, Idaho.

Newlands Project.—J. F. Richardson, project manager, Fallon, Nev.; A. W. Walker, engineer; G. B. Snow, chief clerk and fiscal agent.

North Dakota Pumping Project.—W. S. Arthur, project manager and chief clerk, Williston, N. Dak.; H. C. Melas, fiscal agent.

North Platte Project.—Andrew Weiss, project manager, Mitchell, Nebr.; H. W. Bashore, engineer, Fort Laramie Division; Paul Rothi, irrigation manager; J. R. Ummel, chief clerk; Miss A. L. Perrine, fiscal agent.

Okanogan Project.—Calvin Casteel, project manager, Okanogan, Wash.; W. D. Funk, chief clerk and fiscal agent.

Orland Project.—R. C. E. Weber, project manager, Orland, Calif.; E. T. Eriksen, engineer; C. H. Lilington, chief clerk and fiscal agent.

Rio Grande Project.—L. M. Lawson, project manager, El Paso, Tex.; T. W. Parry, irrigation manager; C. A. Leavey, chief clerk; L. S. Kennicott, fiscal agent.

Riverton Project.—H. D. Comstock, project manager, Riverton, Wyo.; R. M. Conner, engineer; G. H. Murphy, chief clerk; Miss Grace M. McCarthy, fiscal agent.

St. Mary Storage Division.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk; H. E. Bruce, fiscal agent.

Salt River Project.—Being operated by the Salt River Valley Water Users' Association; C. C. Cragin, general superintendent and chief engineer, Phoenix, Ariz.

Shoshone Project.—J. S. Longwell, project manager, Powell, Wyo.; J. R. Iakisch, engineer; C. M. Jump, superintendent of irrigation; W. F. Sha, chief clerk; Miss L. C. Drinkwater, fiscal agent.

Strawberry Valley Project.—W. L. Whittemore, project manager, Provo, Utah; J. E. Overlade, chief clerk and fiscal agent.

Sun River Project.—G. O. Sanford, project manager, Great Falls, Mont.; H. W. Johnson, chief clerk; Miss M. G. Valentine, fiscal agent; G. A. Benjamin, irrigation manager, Fairfield, Mont.

Umatilla Project.—H. M. Schilling, project manager, Hermiston, Oreg.; G. C. Patterson, chief clerk and fiscal agent.

Uncompahgre Project.—L. J. Foster, project manager, Montrose, Colo.; A. H. Peach, chief clerk and fiscal agent.

Yakima Project.—J. T. Lytel, project manager, Yakima, Wash.; R. K. Cunningham, chief clerk; J. C. Gawler, fiscal agent; M. D. Scroggs, superintendent of irrigation, Sunny-side, Wash.; J. S. Moore, superintendent of irrigation, Route 6, Yakima, Wash.; F. T. Crowe, engineer in charge construction Tieton Dam, Rimrock, Wash.; C. E. Crownover and C. F. Gleason, engineers; V. G. Evans, chief clerk; C. B. Fuuk, fiscal agent.

Yuma Project.—P. J. Preston, project manager, Yuma, Ariz.; R. M. Priest, superintendent of construction; S. A. McWilliams, engineer, Yuma Mesa Division; E. R. Scheppele-mann, chief clerk; E. M. Philbaum, fiscal agent.

INDIAN PROJECTS.

Blackfeet Project.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk and fiscal agent.

Flathead Project.—C. J. Moody, project manager, St. Ignatus, Mont.; J. M. Swan, chief clerk; J. P. Siebeneicher, fiscal agent.

Fort Peck Project.—S. A. Kerr, project manager, Poplar, Mont.; Henry Berryhill, chief clerk and fiscal agent.

The Reclamation Record

An ADMINISTRATIVE and STATISTICAL REPORT

Issued Monthly by the RECLAMATION SERVICE, DEPARTMENT OF THE INTERIOR, Washington, D. C.

CERTIFICATE: By direction of the Secretary of the Interior the matter contained herein is published as administrative (or statistical) information and is required for the proper transaction of the public business.

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AN ANNIVERSARY MESSAGE FROM SECRETARY ALBERT B. FALL

To the Project People and Employees of the Reclamation Service.

ON this the twentieth anniversary of the reclamation act it is fitting that we should take inventory of the results which have followed the adoption of a unique policy of internal expansion. I take it that its advocates and the majority of its beneficiaries are agreed that success outweighs failure and that substantial benefits to the Nation have been shown.

I am confident that question is no longer raised as to the ability of the Federal engineers to plan and construct efficiently the monumental works required. The public has accorded generous commendation to those who have rendered this important service.

The primary purpose of the framers of this law and of Congress in enacting it was not only to promote the development and use of arid lands, but also to establish thereon compact and contented communities of small farm owners. If the thought of Congress had been merely to reclaim lands regardless of the size of holdings, authority to restrict the area in individual ownership would not have been conferred upon the Secretary. The lawmakers planned to create as many opportunities as possible for country minded citizens to obtain a foothold on the soil, recognizing that from such citizens the Nation draws its strength. The success of the law must be measured therefore by the extent to which the reclaimed lands are utilized in the making of self-supporting American homes and not by the accomplishments of engineers in constructing great hydraulic works.

Up to the present period of deflation the law has met the acid test of repayment, and, notwithstanding the general depression in industry and agriculture, I believe the majority of irrigation settlers will meet their obligations to the Government when due. A study of those projects whence the greatest number of requests for deferment have come reveals conditions which should be given careful consideration by the project people and the department as well. The inability of the people to meet their payments may be attributed to many causes. The prime cause, of course, has been the depreciation in the price of farm products. It has also been necessary to readjust production to peace needs rather than to the exigencies of war-time demand. It is unnecessary to go into a detailed discussion of the results of deflation as applied, first, to the farmers' or long-time credits; second, to the reduction of the per capita circulation increasing the purchasing power of the dollar and decreasing the value of the products of the basic industries, etc.

In some few instances other causes have been the controlling factor and in many instances contributed to the inability of water users to meet their obligations. Among such controlling and contributory causes may be mentioned the following:

- Purchase of land at speculative prices.
- Too large individual holdings.
- Leasing of lands to tenants.
- Failure to diversify crops and neglect of dairying.
- Poor farming due to inexperience or other causes.
- Lack of organization in marketing.

Obviously it is not the policy of the Government to encourage the use of its bounty in the enrichment of those who do not make use of the land or to extend relief indefinitely to those unqualified for farm life. To do either would be a distinct disservice to those who by industry and hard toil are meeting their obligations. The communities and the Government are alike concerned in seeing that the lands which have been reclaimed by Federal funds are put to the fullest and wisest use. Large holdings must be subdivided and sold to bona fide settlers. The contented farmer is an asset to the community, whereas the failure is a liability. It is the duty of those in the community to assist those who are not farmers or qualified to become successful farmers to find some other vocation to which they are better adapted.

It is cheering to note that project communities are awakening to the fact that a duty rests upon them to get together in working out plans for promoting subdivision and settlement and for a more intensive use of the abundantly fertile

land for which the Government has furnished the water. Local associations are listing lands and are preparing to undertake a comprehensive settlement campaign. In these laudable efforts the department will extend hearty cooperation.

Land hunger has not ceased. The moment is opportune for bringing the advantages and the attractions of these fertile western areas to the attention of the farm-trained citizens who are seeking independence on the land.

The twentieth anniversary of reclamation will be observed generally in a spirit of thanksgiving. Memories of pioneer privations will be tempered by a feeling of gratification that real progress has been made and a bright future is assured. Permanent and substantial are the achievements of those who ventured in the unknown desert. It was their task to translate the visions of Roosevelt, Newlands, and other great reclamation leaders into triumphant realities. In so doing they are guarantors of the continuation of a vigorous self-respecting citizenship.

ALBERT B. FALL,

Secretary of the Interior.

THE WORK OF THE RECLAMATION SERVICE FROM THE STANDPOINT OF THE WATER USERS.

What Reclamation Has Done for the Salt River Valley.

By John P. Orme.

TO show what reclamation has done for this wonderful valley it is only necessary to contrast present conditions with those existing previous to the passage of the reclamation act.

Having pioneered in irrigation in this valley and with 45 years' actual experience in every phase and angle of irrigation from the digging of ditches and canals and leading the water on to the land to serving in the official capacity as president of the Salt River Valley Water Users' Association for eight years, I have had a great opportunity to see and appreciate what marvelous things reclamation has done for this valley.

Before the passage of the national reclamation act in 1902 only 85,000 acres were in seasonal and partial cultivation, though at one time about 145,000 acres had been intermittently watered, but with a series of years of drought followed by short periods of high water, destruction of brush and loose rock diversion dams and consequent loss of crops, litigation over water rights and strife between water companies and farmers, the acreage under cultivation dropped to about 85,000 acres. There are at present over 200,000 acres in the association and another 100,000 acres in the vicinity, but not under the project.

By way of comparison of this period of reclamation with that of the pioneering age which preceded it, I will give a few figures:

Land values at the time of the national irrigation act were \$25 to \$50 per acre. The total assessed valuation for the county of Maricopa was \$3,500,000. The average assessed valuation for 1921 was \$188 per acre and the total assessed valuation was \$128,000,000. School appropriations in 1902 were \$48,000. Last year they amounted to \$1,500,000. We now have in this county a public-school system which ranks among the highest in the United States. The population of Phoenix was at a standstill in

1902 and had been for five years at about 5,000. It is now nearly 35,000. Maricopa County built more concrete roads in 1921 than any county in the United States and expects to duplicate the feat this year. When the program is complete we shall have about 300 miles of concrete roads. All this astonishing growth and advancement is due to reclamation.

Water is delivered to the 160 acres on a 48-hour demand notice. It is especially gratifying to feel that no crop can suffer on this class of service.

Much has been said of the drainage problem of water-logged land on irrigation projects. At the present time this condition has been practically eliminated on this project by the installation of pumps which serve to operate to retard the rise of water to the detriment of productive farming and produce a quality of water which is excellent for good farming. All water used for irrigation is diverted through five power houses. This income practically pays the operation and maintenance of the system.

The Yuma Irrigation Project.

By George M. Bridge.

THIS project is located in California across the Colorado River from Yuma, Ariz., and extends up the north side of the river to the Laguna Dam, a distance of about 12 miles, and south of Yuma in Arizona along the east side of the Colorado River about 26 miles to the line between United States and Mexico. Also it comprises a large tract of mesa land east and south of Yuma bordering on the valley.

The Laguna Dam was completed about March 1, 1908. At the time of the completion of the dam and the siphon and canals there was a very small acreage that was being utilized. Since the Reclamation Service began functioning here about 14 years ago we have developed industries, and especially agriculture, that has been amazing. From the lands that then were covered with brush and weeds now we are harvesting annually from 10,000 to 40,000 bales of

cotton, from 3,000,000 to 5,000,000 pounds of alfalfa seed, and from 20,000 to 50,000 tons of alfalfa hay, besides wheat, barley, and all kinds of feed grains, vegetables, fruits, grapes, and melons. The development here by the Reclamation Service has made homes on farms for about 1,500 families, besides maintaining three small towns and Yuma, building and maintaining schools and good roads.

Our irrigating system is one of if not the best in the world to-day, our only menace being the floods of the Colorado River, which occur annually in June and for which the only safe remedy is the absolute control of the water in the Grand Canyon of Arizona by the United States Government through the Reclamation Service.

Through the untiring efforts of the Reclamation officials, especially Director Arthur P. Davis and Secretary of the Interior Fall and our project manager, Porter J. Preston, working together with the water users we have achieved our present success, and we hope by a close cooperation of officials and water users to be able in the future to meet all the problems that confront us and solve them satisfactorily and to the best interests of all concerned.

Results of Reclamation at Orland, Calif.

By E. A. Kirk.

THE intelligent application of water to the soil represents the highest type of agricultural husbandry. The Government irrigation of California soil has brought to the land of Orland the highest type of American citizenship, which is reflected in every phase of agricultural and commercial development, in school, church, and social circles.

The lands now within the project were, previous to the Government irrigation, devoted to grain farming, and at the time of beginning of the construction of the project by the Reclamation Service some 12 years ago had become so impoverished that they would yield profitable grain crops only on alternate years, averaging about \$15 per acre for the two-year period, whereas the irrigated crop returns of 1921 alone showed a value of \$43.32 per acre.

The project area which originally consisted of a few large holdings, supporting a population not to exceed 200, has been broken up into 663 little farms, which were irrigated last year, having a farm population of 1,900, while the town of Orland, situated in the center of the project and supported entirely by the contiguous agricultural territory, has quadrupled in population during the same period.

Before the advent of Government irrigation the lands now in the project were valued at about \$30 per acre, or a total valuation of \$605,000. At the close of the year 1921 the value of project lands and improvements was given as \$6,150,000. These figures indicate that irrigation development has enhanced land values tenfold. The value of crops produced and live stock marketed in 1921 alone is \$45,000 in excess of the value of the land now in the project before its development by irrigation.

In 1912, the earliest figures available, there were 242 acres in nuts and deciduous fruits and 46 acres of citrus fruits. The agricultural census of 1921 showed the project to have 2,841 acres of nuts and deciduous fruits and 253 acres of citrus fruits.

Equally marked has been the development of pure bred dairy stock and the swine and poultry industries.

The experimental stage in the Orland project has passed. The development and returns of the past justify our unbounded confidence in the potential resources of our district. It is worthy of note that not a settler on the project has ever defaulted in his obligations to the Government.

With our splendid Government irrigation system, our typical California climate, and our naturally drained, fertile valley soils farmed by 100 per cent Americans the future of the Orland project is assured.

The Grand Valley Project.

By D. W. Aupperle.

IN September, 1902, just following the enactment of the reclamation law, Government engineers began a survey of the territory now known as the Grand Valley project. It was then the purpose to make this one of the initial projects because of its favorable location and other known advantages. Some local people failed to recognize the importance of this movement and discouraged Government construction instead of giving it the encouragement it should have had. The Government withdrew.

In 1907 the matter was taken up with Secretary Garfield who, after careful investigation, placed the project upon the approved list and ordered the permanent survey made. In February, 1909, construction work was ordered begun. Then came a change of administration. In May the incoming Secretary ordered work suspended. This suspension order was not revoked until September, 1912, and construction work was resumed in October, 1912.

Water was available for the first unit of land in 1917 and a small acreage was planted to crops with promising results. Water was ready for the second unit in 1918, and the Government land for which water was available was opened to homestead entry. Owing to the unsettled conditions caused by the war, only a portion of these lands were then entered. These settlers got started late and began operations under the handicap of high cost of all necessities. The results for the season were only fairly remunerative.

In 1919 more lands were developed and the season proved quite satisfactory. The season of 1920 started with even greater promise and with increased acreage, but the slump in farm-produce values left the farmers at the end of the year without profit on their operations. The year 1921, with high cost of producing and low prices for products, placed the farmers in an uncomfortable position.

However, the settlers are a practical and a plucky bunch and they have entered the crop season of 1922 with a determination to win.

The practical results from Government reclamation to date are:

The construction of a substantial irrigation system.

The development of farm units embracing about 20,000 acres of land.

The establishing of 400 new homes.

The creating of taxable property valuation amounting to \$1,250,000, with only a small portion of the lands on the taxable list.

A total crop production of \$2,120,000, being equivalent to an average annual production of \$48 per acre.

The real results are, however, yet in prospect only. Eventually it will result in the development of 50,000 acres of highly productive lands which will provide homes for many families under highly desirable surroundings, all of which will add greatly to the local community and the public at large.

Eleven Years of Reclamation on the Uncompahgre Project.

By Dr. A. C. McClanahan.

ELEVEN years ago the western end of the Uncompahgre project was barren of all growing things except a diminutive spiny cactus, stunted by nature, and Russian thistles and sparse wild grass stunted by lack of moisture. The effect of desolation was enhanced by the indistinct remains of an abandoned ditch, a few scattered fence posts too far decayed to tempt a thief, and the skeletons of apple trees that had died an early and thirsty death, thereby completing the despair of some forgotten pioneer who had bet against the desert and lost. In the midst of all this barrenness the sudden appearance of a tent, a barrel of water, and a little pile of coal was so conspicuous that curious residents came to offer sympathy and find food for humor in a region in which each joke must needs live long if there is to be frequent laughter.

Did one suppose, they asked, that the new but unfinished Government ditch would ever be completed? What purpose could the Government have in providing a practical canal adequate to water this rocky and infertile waste on which—though several had tried—no living thing had ever been able to abide except prairie dogs and bull snakes?

The visitors would then pass on leaving the settler time to wonder whether anything ever would grow above 2 inches in height in this unpromising soil, and time to notice that nothing ever had, and that such things as grew at all were, despite their puny stature, permanently inclined to the northeast in token of the direction and potency of the prevailing winds. As the callers rode away they would exchange knowing glances and point significantly to their foreheads and nod wisely.

* * * * *

The persons who now come are strangers to those days and speak enviously of the rich opportunity of that earlier

day in which one could "pick up" a piece of land of such abounding fertility as this in a climate so delightful—where vegetables, grain, and fruit of every sort grow so abundantly; where it is possible to border paths with flowers of such rare beauty; where there are so many varieties of song bird, and trees of so much sturdier stuff than Carolina poplars and cottonwoods to screen one's house.

When one points out that the house now stands about where the tent once baked in desert dust and sunshine, and vouchsafes further reminiscences of that trying time one notes anew the signs of incredulity. This time, however, it is not one's sanity but one's veracity that is suspected. And the unbelief remains till verbal testimony is reinforced with photographs that prove that this whole transformation has been effected in 11 years.

The Boise Project, 1904-1922.

By G. H. Hogue, Assistant Engineer.

PREVIOUS to the spring of 1904 the Boise project existed only as a dream. Sagebrush land extended to within 2 miles of the State Capitol on the south. At that time surveys were begun following the line of the old New York Canal and extending this line in a southwesterly direction. After crossing Ten Mile Creek human habitation was scarcely visible for many miles. A rugged sagebrush plain was crossed with Kuna Butte and Madden Butte as landmarks. At present the towns of Kuna, Bowmont, and Melba are centers of this area.

A few homes with reclaimed land existed in the basin of the present Deer Flat Reservoir but below and to the northwest of the present Lower Embankment there existed a sandy sagebrush area of enormous proportions. At present the towns of Houston and Wilder are commercial centers of this tract with railway transportation.

In those days there were no highways. All roads ran "across country" and were tracks through the sagebrush the width of the tread of a wagon. When this became impassable through dust or mud another one alongside was attempted. Often loose lava rock added variety to the road surface. Transportation was by mule or horse teams with buckboards or wagons.

Finally construction of irrigation canals and structures began. The engineers directing work, where water for camp use as well as for construction purposes had to be hauled over such roads, were prepared to sympathize with the early settlers who had to haul water, clear the land of brush and sometimes rock, and after water came plant a crop which the jack rabbits promptly ate as soon as vegetation appeared above the ground.

Now things are different. Improvements in all lines are about equal to that in transportation. Modern highways and roads permit the project manager to be in the office during the morning and afterwards by automobile visit distant parts of the project, returning before night. Likewise, a settler, with his family, may visit Boise, call at the project office, attend to other business, and return home in time to do the chores.

Effect of Irrigation on the King Hill Project.

By A. B. Montgomery.

THE Snake River Valley, in which is located the King Hill project, consists of lands which without water for irrigation purposes would be practically worthless; whereas by the application of water any crops native to the Temperate Zone may be successfully grown.

The irrigation of the valley has not only provided homes for a great number of citizens who otherwise would have been unable to obtain farm homes, but it has created taxable values in excess of the entire cost of the project, which values are not of a temporary nature but will endure and increase and be a perpetual benefit to the community, State, and Government.

While the construction of irrigation projects contemplates the building of canals and water courses, it is a fact that the building of highways, railroads, and other means of transportation go hand in hand with such reclamation construction. The initial benefit received by the community is from the moneys expended for labor during the construction period. This is probably more noticeable in communities where there has been some settlement before the work of reclamation is begun. This money very largely remains in the community interested and is of material aid to the farmer until he gets his land on a paying basis.

In our community, which has always been devoted to stock raising, it has been of immense value to the stockman, as he now is enabled to winter and fatten his stock at home instead of shipping to adjacent States, and this affords him the opportunity of taking advantage of the highest market prices.

The arid sections of the West realize and appreciate the value of irrigation as a matter of crop insurance in times of drought. There is nothing in the way of an agricultural venture more certain than a crop by irrigation.

In my opinion one of the greatest benefits to the Government and State derived from reclamation work is that it creates the small family owned and family operated farm which makes possible the highest form of rural life, affords the boys and girls the same educational, religious, and community advantages to be found in the cities, and through such interests keeps them permanently identified with farm life.

The Minidoka Project.

By William Trieber.

"BE sure you've got a good water right, and then see about the land, because you can raise a lot of stuff on poor land if you have the water, but you can't raise anything on the best land without it."

This was the advice given me by my seatmate, as I was traveling westward from Denver in 1911 to look for a farm. He was a man about 50 years old, and told me he had spent most of his life on irrigated land in Colorado and Washington.

It looked like reversal of the usual order to make water the first consideration when looking for a farm, but I kept his advice in mind, and it had a good deal to do with my selection of the Minidoka project for my home.

It was considered, and has since proved, to have one of the best water rights in the country, and the soil has proven wonderfully productive. At that time it wasn't thought that clover seed could be grown successfully, but since then yields of clover seed of 8, 10, and 12 bushels per acre are not at all uncommon.

Sugar beets had not been tried at that time, but now we have two factories on the project, each with a capacity of 500 or 600 tons of beets a day.

We grew some potatoes, but never expected to rival Colorado, but later it has seemed as if our yields of potatoes were only limited by the amount of painstaking care we were willing to bestow on the crop. That is largely true of all crops grown here.

There is no place so well adapted to intensive farming as irrigated land because not only is it possible to put the water on the crop just when it needs it, but to shut it off when that particular crop doesn't need it, which is equally desirable and equally impossible in a rainy country.

I think I can best show the rapid development of the project by the growth of the schools. Take the Paul School as an example. In 1911 Paul was a siding on a branch railroad running through the project. In 1912 the first store was opened and a small schoolhouse was built having 1 teacher and 15 pupils. In 1914 a larger house was built having 46 pupils. In 1916 this was again found to be too small, and a fine brick building was put up which was again added to in 1918 and 1919, and now the teaching force numbers 18 and over 300 pupils are enrolled. All this building, together with waterworks, sewers, and paving, has been accomplished, a 25-year job, in 9 years' time.

The farmers have kept pace with the towns in improvements, and now most of them are using electricity to light their houses and barns, pump water, run washing machines, and separate their cream; many are using the juice for heating and cooking; all of which leads me to believe that the old man was right in his advice, and that much can be accomplished with *water plus good land*.

Some Results on the Milk River Project.

By Amos Kelly.

I CAME to this project in May, 1913, and after working on the main canal for about two months decided that the climate was O. K. for the production of abundant crops if they were properly cultivated and watered, so I purchased a farm and moved to it August 1. I did not do any irrigating until 1917, and my successes have been somewhat varied, though I have produced 53 bushels of wheat per acre, 6½ tons of alfalfa hay per acre from three cuttings in one season, for which I received \$27 to \$32 per ton baled f. o. b. the station, also I have sown 20 acres

of alfalfa with wheat for a nurse crop and after harvesting the wheat got a cutting of alfalfa the same season which averaged 1,600 pounds on the entire 20 acres. I have also had a yield of 100 bushels of oats per acre, 47½ bushels of barley, and 500 bushels of potatoes. After building up the soil by raising alfalfa upon it one should average a yield of 50 bushels of wheat, 100 bushels of oats, 60 bushels of barley, 300 bushels of potatoes, and 5 tons of alfalfa. Of course this can't be done from the sidewalk in town. One has to be ever on the job and watching for something to do.

The last two years have been harder as depreciation in values of stock, etc., have taken all our profits, but we are looking for something better this season.

On the Eastern Slope of the High Sierras: The Newlands Project.

By Edmund Dietz.

IN January, 1908, I first set foot on Nevada soil and was charmed by its salubrious climate. I came from Indiana in response to an announcement in the agricultural press, setting forth the facts as related to desert reclamation just then inaugurated by our Government in the Truckee-Carson (Newlands) irrigation project.

For some reason or other the romance of the desert, so faithfully portrayed in the history of the Holy Land, the great fertility of the valley of the Nile coupled with the prospect of practically always certain harvest, not subject to the vicissitudes of the weather, had made a great impression upon me, and after looking the land over I decided, with more enthusiasm than knowledge of the prospective hardships, to locate here.

During the last 14 years I have helped to build up the project. I enjoy the title of pioneer. I have seen pessimism turn into optimism and the latter into success. As we look back we glory in the hardships we encountered and overcame. A newcomer now entering land, water for which is still available, has no longer a problem; he draws on the experience of his older neighbors and with their practical advice and the assistance of the Reclamation Service personnel, is sure of success.

So gigantic a proposition as the reclamation of the desert, that means the practical and impartial distribution of so great a natural wealth as is our water, can only be safely inaugurated by our Government; even then the Reclamation Service, the responsible bureau of the Department of the Interior, receives much unjust criticism for any error, real or imaginary, it may have made. But we are getting over that; we are beginning to realize the immense benefits of reclamation made fully available through the Reclamation Service to even the smallest holder of land.

We obtain good profits from small areas intensively farmed and by selecting special crops peculiarly suited to our conditions and growing them to perfection. Thus we shall insure our future and the future of those to come after us. Out of this raw unpromising wilderness there

is rising, like Phoenix out of the ashes, an empire of prosperity and happiness nowhere excelled and in which the Reclamation Service plays a conspicuous part.

The Carlsbad Project.

By Francis G. Tracy.

NO more striking evidence of the beneficent effect and unshakable stability of Government-initiated irrigation is to be found than in Carlsbad project. The effect of practical reclamation is to uplift not only the immediate community, but to develop the entire environment to the visible horizon and even beyond. All southeastern New Mexico—an empire in extent, destined to support an abundant and virile population and to exercise a commanding influence upon the whole State—owes its railroads and settlement to the vision and initiative of those who began irrigation at Carlsbad, although in their own enterprise they succumbed to disaster.

In 1906 the Reclamation Service assumed control and repaired the irrigation works to save from complete bankruptcy a community deprived of water for two years through the loss of Avalon Dam. In spite of initial disappointments, misunderstandings, and individual failures, the strong arm of the Government carried on steadily to final success.

To-day, with its wonderful climate, abundant water, promise of through railway connections, prospects of doubled productive area through an extension of the project should investigations now nearing completion prove satisfactory, a long-growing season, a very wide diversity of staple crop production, a hustling, hopeful, and mutually helpful population, Carlsbad project looks with confidence to the future, relying implicitly upon self-help, building upon the foundation laid in Government-constructed irrigation works and upon Government backing as insurance of stability that no disaster can destroy.

Repayments to the United States are \$634,878.35 upon construction and operation and maintenance cost of \$1,810,946.27. We are now meeting the second 6 per cent charge upon construction. Without other credit facilities, outstanding accruals unpaid are \$120,000, March 31, 1922, as against less than \$17,000 June 30, 1920, partly due to 50 per cent increase in annual construction accruals for these two years, but chiefly to the slump in crop values in 1920. Our indebtedness increased only \$15,000 the past 12 months, and a good crop this year with fair prices will reduce it at least \$50,000.

No appeal for general relief has gone to Washington from Carlsbad project, and we have this year spent nearly \$250,000 in local improvements and forward-looking surveys and investigations. We stand confidently upon our own resources; with an average crop production in 1921 of \$41.53 per acre, and for cotton \$72.48. The total value of crops produced since the inception of the project by the United States has amounted to the stupendous sum of \$7,784,258.44, or a mean average value of \$39.77 per year. Taught by experience, Carlsbad project stands unanimously for Federal reclamation and the McNary bill.

The Rio Grande Project.

By Roland Harwell.

THE organization of the Reclamation Service as a Federal agency of irrigation promotion finds, after these 20 years of operation, ample justification in the many monuments of agricultural industry now prevalent throughout the West. In those instances where great skill and heavy investment were prerequisites of irrigation development, the Reclamation Service found its natural field, and it is but logical that the resultant work should appear unusually spectacular.

In the instance of the Rio Grande project, the mere construction of the dam to a height of 306 feet under conditions requiring over a half million yards of masonry, would appear sufficient to place this project in the realm of remarkable engineering. Couple the dam with its resultant lake of over 2,600,000 acre-feet of capacity, then add 4 diversion dams, 500 miles of irrigation canals, and 225 miles of drainage canals, and the true perspective of the engineering importance of the project becomes apparent.

Engineering feats of this nature are important only in proportion to the success attained in the preparation of land for economic production. Thus, land and home development have gone hand in hand with the extension of constructed works on the Rio Grande project. From a few thousand acres dependent on an irregular river flow and supplemental pumping, farms in active cultivation now extend from one extreme of the project to the other. Excellent roads now displace obscure and sandy wagon trails, villages are now linked in close communication with each other and the central city of El Paso, and beautiful homes now occupy the space of the native mesquite and cacti. These things should suffice in accounting for the economic success of the project. The gradual and orderly effort put forth by the resident landowner, in absence of boom and inflation, designates the stability of the enterprise.

In all, the early development and success of the Rio Grande project, if not its ultimate development, are directly creditable to the originators of the Reclamation Service. It is but one instance of the many remarkable works which make homes and enterprise out of vast arid regions formerly regarded as valueless.

The North Dakota Pumping Project.

By M. Sorensen.

EVERY one knows that the North Dakota pumping project has had about the hardest struggle of them all. Private lands, large holdings, tenancy, nonresident owners, land speculation, humid years in a normally semiarid climate, the early day horseback farmer—all have had a hand in its misfortunes. Reorganization as an irrigation district on a business basis and a high degree of cooperation between local reclamation and irrigation district officers are putting the project squarely on its feet.

We were slow in learning the lesson of diversification; but having learned the bitter lesson of having all our eggs in one basket; that is, limiting ourselves to grain crops, we are now doing well in alfalfa, corn, potatoes, and dairying, and the outlook is brighter.

Our crop yields average twice to three times the average farm yields of our county. We believe our general condition averages about the same. We believe we have a straightaway ahead.

Development of the Umatilla Project.

By E. P. Dodd.

AFTER 15 years of experience and observation on the Umatilla project, I am convinced that the ultimate purpose of the Government in reclamation work here will be fulfilled. When I look back at the sage plains, while the canals were under construction, and cast an eye over the present green fields, many homes, orchards, shade trees, hedges, and highways, full development becomes self-evident. The tracts yet unreclaimed will one by one assuredly become productive through the varied forces set in motion during the past decade and a half.

The Government has expended over \$2,500,000 and the settlers more than this sum, and along with these financial investments we have a great fund of experience that has resulted altogether in stability. Our farmers are more self-reliant and confident and have a home feeling. They are not trying untried things, because most everything has been tried out from sweet potatoes and almonds to beets and Dicklow wheat and live stock of all descriptions. After all the sifting there are a few things which back the banks and the banks back, and these things do their work both when times are good and times are bad. In brief, we have learned to tie our success to alfalfa, corn, the cow, the hog, the honey bee, the homely "spud," and a few other diversified products.

As time and development move onward we will enjoy other products which our soil and conditions make possible, but we only play with these variations now. With established pursuits and a settled citizenship, under rapidly improving circumstances, there can be no disputing the successful outcome of the Umatilla project.

The original project contains 17,000 acres. The West Extension canal covers 11,300 acres more. The Secretary of the Interior has authorized the beginning of the McKay Creek storage, which will supply water to about 35,000 acres, and with other edges yet to be supplied the greater Umatilla has a definite future of nearly 65,000 acres.

Allied with the Reclamation Service, the people of the half dozen communities affected have taken a strong hold on the present and the days to come. They look back over their experiences and measure their steps ahead. They are conservative now, but possessed of a strong spirit of progress, and in these difficult days of recuperation from war habits and of reconstruction, they are taking hold of the problems of the hour with full hope and determination. We are a part of the Nation's established life and will become a much greater part of it in the future.

What the Strawberry Valley Project has done for Payson.

By Henry Erlandson.

PAYSON is a new old city, now the center of the Strawberry Valley irrigation project. Omitting early pioneer history and going back to 1890, the population was approximately 2,600, of which about 2,000 were supported by agriculture. The meager water supply was spread over some 2,000 acres of fertile but thirsty soil.

In 1900 to 1905 the population had diminished by several hundred, and the healthy morale of the remaining had shrunk to near zero. Homes could be bought for 20 per cent of their cost. Almost everybody wanted to get out. The total bank resources were approximately \$100,000. Our only gristmill, like many other establishments, had gone up in smoke. The few inhabitants remaining wondered how long before they too might be wafted up and away by the dry hot summer winds coming often as early as May.

In 1905 the proposed project was being talked of in a general way as a dream of the future. By 1908 progress to a probable realization of this dream was in sight. On May 26 and 27, 1916, Payson celebrated the completion, adding sufficient water to irrigate 25,000 acres of fertile, arid land, contiguous to Payson alone. Every one of these acres is now under cultivation and is improving in yield each year. Depression as before is unknown. Community morale is high. While much effort is yet necessary to pay the bill, these efforts will eventually bring their own rewards.

Payson's population has increased 50 per cent. It is now a rather cosmopolitan city—waterworks, paved streets, increased interest in education, churches active, hundreds of new modern homes, etc. Bank resources have gone up 1,000 per cent. A sugar factory and the Inter-Urban Railroad were added as larger direct results of increased resources. Other business increased in similar manner.

The climate in late years seems wetter. We are wondering to what extent irrigating added acreage helps.

The Belle Fourche Project.

By C. D. Sanders.

THE Belle Fourche project is in western South Dakota northeast of the famous Black Hills. The altitude is about 2,800 feet. The temperature is several degrees warmer than that of eastern South Dakota, Minnesota, and Wisconsin. We can raise successfully every crop raised in the United States east of the Rocky Mountains and north of Mason and Dixon's line.

Our chief crops are alfalfa (its natural home), all small grains, corn, sugar beets, and garden truck. Our proximity to a vast range country of the best and most nutritious grasses in the world makes this project an ideal place for feeding and fattening range cattle and sheep. It has been demonstrated that alfalfa fed with corn, barley, oats, and speltz, all of which are successfully grown on the

project in this clear and dry atmosphere, will make more pounds of gain for the amount of feed consumed than in the humid climate of the feeding yards of eastern Nebraska, Iowa, or Illinois. There are other economies also, such as saving in freight which has to be paid only once, while buying commissions are eliminated.

The hog industry is also very profitable. Irrigated alfalfa, green and tender from May until in November, reduces by half the cost of raising the porker. Dairying is an important industry which is growing rapidly and promises to take an important place in building up a prosperous community. Alfalfa and sunshine make a paradise for bossie, and she responds with a full pail of creamy milk.

The Belle Fourche country is several hundred miles nearer the great stock markets of the East than most other irrigated sections of the country, and this means a great deal in lighter transportation charges and better prices with less shrinkage in weight. But the greatest advantage we have here over all other good farming districts, either irrigated or otherwise, is low land valuations. We have never had the fictitious land values that have afflicted nearly every other section of the country. Lands have not been boomed to the point where they fail to pay interest on the money invested where properly farmed. Good irrigated land with improvements can be secured here at \$50 to \$75 per acre with a very low water right cost, and good schools, churches, graded roads, telephones, and a people who will welcome you to become their neighbors. An abundance always of water for irrigating crops when the dry season approaches gives the thrifty farmer a feeling of security which can only be appreciated by the man who has seen his promising fields of wheat and corn consumed in a period of two or three days by the too frequent hot winds so familiar to every farmer living west of the Mississippi and Missouri Rivers.

On the Okanogan Project.

By John S. Petersen.

THE Okanogan irrigation project was the first Government project in the State of Washington undertaken by the Reclamation Service.

In 1902, when the law was passed enabling the United States Government to furnish the capital required to build irrigation projects, a few of the early settlers on the lands of the present Okanogan project got together at once and drew up a petition to the Secretary of the Interior asking for an investigation of the possibilities of this country for irrigation, and in the spring of 1903 the Secretary ordered a corps of engineers to make a careful survey of the lands. After a long and careful survey and thorough investigation it was approved by the Reclamation Service and the Secretary of the Interior and work was started.

The Okanogan project is not only the first project undertaken by the Reclamation Service but it is also one of the very best. It holds the record for the highest gross returns

per acre of all the Government projects. The principal product is boxed apples and it is very rapidly becoming famous for its Delicious, Winesap, Jonathan, and Spitzenberg varieties; and in November, 1921, at the Northwestern Apple Exposition held at Seattle, Wash., it proved that it raises the best apples in the world. At this exposition the Okanogan project received 18 prizes out of 19 entries of apples, and won the big silver cup offered by Steinhart & Kelley, of New York, to the district taking the largest number of prizes.

Before the Reclamation Service started work the lands were a barren waste covered with sagebrush and bunch grass; now it is supporting many hundreds of families, prosperous and happy, and, through their support, the thriving town of Omak came into existence and has grown to a population of over 1,000 people. In 1921 there were shipped through this town over 1,000 carloads of apples and through Okanogan town, situated at the lower edge of the project, 350 cars more, all from irrigated lands in this district that 15 years ago produced nothing but a scanty pasturage for a few horses and cattle.

The Sunnyside Division of the Yakima Project.

By Gordon P. Miller.

THE Sunnyside Division of the Yakima project differs from many others that have been developed by the Reclamation Service in that it was not initiated by the Government, but was started by a private corporation. Irrigation in the Yakima Valley has been the development of many years. The first enterprises, moderate in size, were started and successfully carried out by private companies, but for the much larger Sunnyside project private capital was found inadequate and the Reclamation Service stepped in to carry the burden of financing until more complete settlement should make it self-supporting. Since then its history has been one of gradual and steady growth, new areas being added at a rate that fairly kept pace with the increased demand for farm products.

We have had our share of difficulties, both on the part of the individual irrigator and in the management of the project, but the progress during the past 16 years has been great. It would not be too much to say that it has been marvelous, and for this result a large share of the credit must be given to the Reclamation Service.

To one who has observed the progress of irrigation in the Yakima Valley, the conclusion is irresistible that only through the generous aid of the Government can large projects like the Sunnyside be brought to a successful issue.

The Tieton Division of the Yakima Project.

By Dan H. Williams.

AS a water user on the Tieton Division of the Yakima project ever since water was first turned into the Tieton Canal, I am convinced that irrigation has been our salvation. The land was practically all in sagebrush until

the Reclamation Service put water on it, and was of practically no value, except for grazing. As evidence of what irrigation has done for it, the State sold at public auction last January 367 acres of school land at an average price of \$88 per acre. Before water was available for this land it would not have brought to exceed \$2 to \$3 an acre. The State has thus reaped the benefit of irrigation, and this without any expenditure on its part for construction or maintenance of the irrigation works.

There are at the present time about 1,350 farms on the Tieton project, 78 per cent of which are farmed by the owners, the majority having very comfortable, modern homes. One of the finest country homes in the State is located on this project on land that was until 1916 in sagebrush. I refer to the home ranch of Mr. Lloyd Garretson.

We have fairly good roads all over the project, excellent schools, including two high schools, and a branch of the Northern Pacific Railway furnishes daily rail transportation to the center of the project, thus facilitating the marketing of crops. All this would have been impossible without irrigation.

The State and county receive an annual revenue from the project of about \$120,000 in taxes. Before water was put on the land, the taxes were only a very small fraction of this amount.

For the past three or four years the value of crops each year has exceeded the total construction cost of the project, and these returns are expected to increase from now on as more land is brought under cultivation and the orchards come into full bearing. The leading industry, of course, is fruit (apples, pears, and peaches), and the largest return is from this crop; but there is also a considerable acreage in alfalfa and potatoes, and dairies are increasing each year.

The Tieton project, with the other Government project built about the same time (the Sunnyside), has doubled the population of Yakima, and made it one of the most prosperous towns to be found anywhere in the United States. During the past two years we have felt the hard times to some extent, but have not suffered as much as some sections, because land values were not boosted during the more prosperous years, and prices have been maintained.

Irrigation on the Blackfeet (Indian) Project.

By W. P. Goff.

WE are now in a reconstruction period and I am convinced the day of large farms is fast passing, and should be. Most of the land in the rain districts has passed from the Government into the hands of the settler, and now large tracts of land are being reclaimed by the Government from the desert and made suitable for production. The Government can not make those lands produce without the settler and as our interests are so closely allied let us cooperate with the Government and make these projects a success, and the Reclamation Service will more than meet us half way.

Lands on projects that are in the fruit and vegetable belt and near to markets are more valuable and capable of supporting a family on smaller acreages than lands in those sections which depend upon mixed farming and are far from market.

In 1917 and 1918, as a war emergency, leases were granted on the southern portion of the Blackfeet Reservation for six-year periods. These leases contained from 200 to 7,500 acres and the land has been farmed mostly to wheat for four years. The lessees knew little about irrigation but the average production on irrigation lands where the water was used before the grain was damaged was over 20 bushels to the acre, while production on dry land did not average 5 bushels. With smaller acreages for mixed farming, and rotation of crops, the irrigated lands will produce 30 bushels to the acre.

In this section where mixed farming is carried on, I would be in favor of allowing 80 to 160 acres to each settler, and if the land were reasonable in price there is no reason under ordinary circumstances why the settler should not be in a position to have most of the comforts which this age calls for.

Ranching on the Two Medicine Division, Blackfeet (Indian) Project.

By D. R. Weber.

THE Blackfeet Indian Reservation is one of the few remaining sections of the West where opportunities in the line of ranching are still available. The location in the northern part of Montana, and bordering Glacier National Park, with snow-capped mountains continually in view, helps one to forget the loneliness so common to the prairie.

The Two Medicine Division comprises one of the irrigated tracts of the reservation. We are farming a rather large acreage under this ditch.

The soil, although of glacial deposit, consists of a light black loam containing some gravel, and underlain with various strata of clay and gravel. This affords good drainage, making it very susceptible to irrigation.

The climate favors artificial methods of supplying moisture. Long days of continuous sunshine make ideal growing conditions after water has been applied.

The crops most extensively grown are wheat, oats, and flax, although many farmers plant a portion of their acreage to barley and rye. Spring seeding is done during the latter part of April and the forepart of May. About 100 growing days are required for maturity. The yield per acre is about the same as in other grain-producing countries, where staple crop conditions exist.

All varieties of hay thrive in this section. Alfalfa is one of the principal tame hay crops, and with two cuttings per season will yield about 3 tons per acre. Wild prairie hay (bluejoint) takes readily to irrigation and without any cultivating is becoming one of the greatest assets to this community.

The country is naturally adapted for stock raising and this aids in many ways the irrigated ranches where grain and hay are grown. Grazing land, close to our grain ranch, is still available. This has made it possible for us to accumulate and maintain a nice herd of range cattle. It also gives us a splendid opportunity of using the crop roughage for winter feed.

Hogs are pastured on alfalfa until the grain is threshed, when they are turned into the stubble, where they fatten for market. The grain, usually wasted around stacks and threshing machines is carefully gathered up and utilized for late winter and spring feed.

Potatoes and other garden vegetables are grown successfully.

Everything grown here finds a ready market through our local stockyards and elevators. This, in part, accounts for the irrigable land being gradually put under cultivation and good homes established.

The Flathead (Indian) Project.

By G. L. Sperry.

FIRST impressions are perhaps most lasting. My first impression of the Flathead, I shall never forget. The evergreen trees, the clear sparkling streams, the green of the foothills, and the wonderful Mission Range of mountains which after 13 years holds yet an undiminished fascination for me, all impressed me most profoundly, and made me feel that here indeed was a goodly place to make a home, and live out one's days.

But the great body of agricultural land lying away from the foothills was drab and dead for the most part, except where an occasional old-timer's ditch had given a touch of green, awaiting the touch of the Reclamation Service with its magic wand, water, to transform it into green fields of alfalfa, timothy, and clover, pastures filled with cattle and hogs, mile after mile, thousands of acres dotting the valley like an immense checkerboard, awaiting the touch of the newcomer to fill the intervening spaces and make it all one vast ocean of green.

The Flathead, the "Garden of the Rockies," the home of the cow, the chicken, and the swine, is coming into its own. The normally moderate winters make it an ideal place for live stock.

As the hand of the Reclamation Service, through its engineers and personnel, has been working this transformation on the land through the distribution of the life-giving fluid, water, so the hand of private enterprise has been busy converting the old Indian trading posts and creating new up-to-date towns with modern schools and facilities, where the farmer may satisfy his material and social needs.

The Northern Pacific has spanned the valley connecting its transcontinental line on the south with the Great Northern via Flathead Lake, on the north, putting us in touch with the Nation commercially, socially, and educationally.

The pioneering days of the Flathead are over; we are on our way.

TWENTY YEARS OF RECLAMATION, JUNE 17, 1902-JUNE 17, 1922.

THE approval by President Roosevelt of the reclamation act on June 17, 1902, marked an expansion of the homestead policy of the Nation adapting it to new conditions. Twenty years have elapsed since the approval of the act. Much has been written both in praise and blame of what has been done, and a bibliography on the varied phases of the work of the Reclamation Service would in itself form a volume of respectable size. It is appropriate, therefore, at this anniversary to review the work of the past two decades, not merely to call attention to the achievements but more especially to draw profitable lessons for the future. With this object in view the following statements and diagrams have been prepared in the hope that they will be studied, and that their thoughtful consideration will result in a broader understanding of the economic value of a nation-wide policy of reclamation and use of all fertile but idle lands in making opportunities for small, self-supporting farm homes.

Receipts and Expenditures (Fig. 1).

Receipts.—During the 20 years which have elapsed since the passage of the reclamation act there has come into the reclamation fund a total of approximately \$133,230,318. During the first few years the receipts were altogether from the sale of public lands. During the fiscal years

1914 to 1918 the United States Treasury advanced to the reclamation fund a total of \$20,000,000. Later, by congressional action, a certain portion of the royalties and rentals from oil and potassium leases on public land were credited to the fund. The loan, or advance, of \$20,000,000 is being returned to the General Treasury at the rate of \$1,000,000 per annum, beginning with the fiscal year 1921. After paying back \$2,000,000 by the close of the fiscal year 1922 the accumulated total in the reclamation fund is approximately \$131,230,318. Incidentally, during the progress of the work some other funds have been made available from the General Treasury, totaling \$3,691,690, making a grand total of \$134,922,008.

Under the terms of the reclamation act all the collections or repayments on account of the construction of irrigation projects or other operations incidental thereto are credited back to the fund to be reexpended for similar purposes. These collections, totaling \$41,455,900 to date, do not increase the investment of the United States but constitute a working capital, by means of which the Reclamation Service is able to continue the work.

Table 1 gives, by years, the funds which have been made available from all sources to June 30, 1922, together with the turnover, the figures for 1922 being partially estimated:

TABLE 1.—Funds, from all sources, made available for reclamation of arid lands.

Year.	Reclamation fund.				Other funds.	Grand total.	Reclamation turnover.
	Sale of public land and town sites.	Treasury loan.	Oil and potassium royalties.	Total.			
1901	\$3,144,822			\$3,144,822		\$3,144,822	
1902	4,585,521			4,585,521		4,585,521	
1903	8,713,997			8,713,997		8,713,997	\$242
1904	6,826,254			6,826,254		6,826,254	711
1905	4,805,515			4,805,515		4,805,515	1,339
1906	5,166,336			5,166,336		5,166,336	22,925
1907	7,975,667			7,975,667		7,975,667	96,449
1908	9,443,438			9,443,438	\$33,114	9,476,552	518,102
1909	7,765,485			7,765,485	137,074	7,902,559	754,401
1910	7,088,299			7,088,299	247,217	7,335,516	1,722,578
1911	6,205,017			6,205,017	327,876	6,532,893	2,034,339
1912	5,672,723			5,672,723	214,052	5,886,775	2,454,824
1913	3,755,695			3,755,695	39,166	3,794,861	2,360,114
1914	3,475,732	\$3,500,000		6,975,732	1,501	6,977,233	2,742,158
1915	3,286,494	8,500,000		11,786,494		11,786,494	2,391,071
1916	2,669,247	3,500,000		6,169,247		6,169,247	2,349,019
1917	2,896,636	1,500,000		4,396,636		4,396,636	3,182,233
1918	2,613,641	3,000,000		5,613,641	659,365	6,273,006	3,459,446
1919	2,014,859			2,014,859	340,469	2,355,328	3,862,225
1920	2,688,148			2,688,148	594,741	3,282,889	4,911,882
1921	2,806,403	¹ 1,000,000	4,630,389	6,436,792	689,115	7,125,907	4,191,884
1922 ²	2,000,000	¹ 1,000,000	3,000,000	4,000,000	408,000	4,408,000	4,400,000
	105,599,929	18,000,000	7,630,389	131,230,318	3,691,690	134,922,008	41,455,942

¹ Deduct; repaid to General Treasury

² Estimated.

Figure 1 shows graphically the amounts and sources of the receipts during each year, as indicated by the height of the vertical lines or bars above the base or zero line.

The sources of the available funds are indicated as follows:

- (a) Sale of public lands by heavy crosshatching.
- (b) The Treasury loan or advance of \$20,000,000 by open space in the bars.
- (c) Oil and potassium royalties and rentals by small circles.
- (d) Other miscellaneous funds by vertical lines.

The portion of the bars lightly crosshatched represents the turnover, or that part of the reclamation fund which has been paid back and reexpended.

For the first fiscal year, that ended June 30, 1902, there were available not only the proceeds from that year but also those from the previous year, as the law when drawn was made applicable to the receipts for 1901, so that at the outset there was a total of over \$7,700,000 on hand.

The proceeds from the disposal of public lands increased somewhat during the early years, reaching the maximum in 1908 of nearly \$9,500,000, then decreased to a minimum

of \$2,000,000 in 1919, increasing somewhat, and then decreasing to the estimated amount of \$2,000,000 for 1922.

During this time the collections and repayments have steadily increased, reaching a maximum in 1920 of nearly \$5,000,000, and being estimated for the current year, 1922, as \$4,400,000.

The loan of \$20,000,000 constitutes a mortgage on future receipts as indicated in the right-hand half of the diagram.

Expenditures.—As indicated by the table of receipts, there has been made available for the reclamation of arid lands during the 20-year period, June, 1902, to June, 1922, a total of \$134,922,000. This is the amount invested by the United States, the Reclamation Service acting as trustee. This fund is being used primarily in the construction of irrigation projects, but incidental to this work it is necessary to make some investment in materials, supplies, equipment, etc., prior to their being absorbed in the cost, and in the operation and maintenance of completed or partly completed projects pending transfer to organized water users. Some of the fund has also been used in the investigation of projects, construction of which has not been approved, and there is always retained in the Treas-

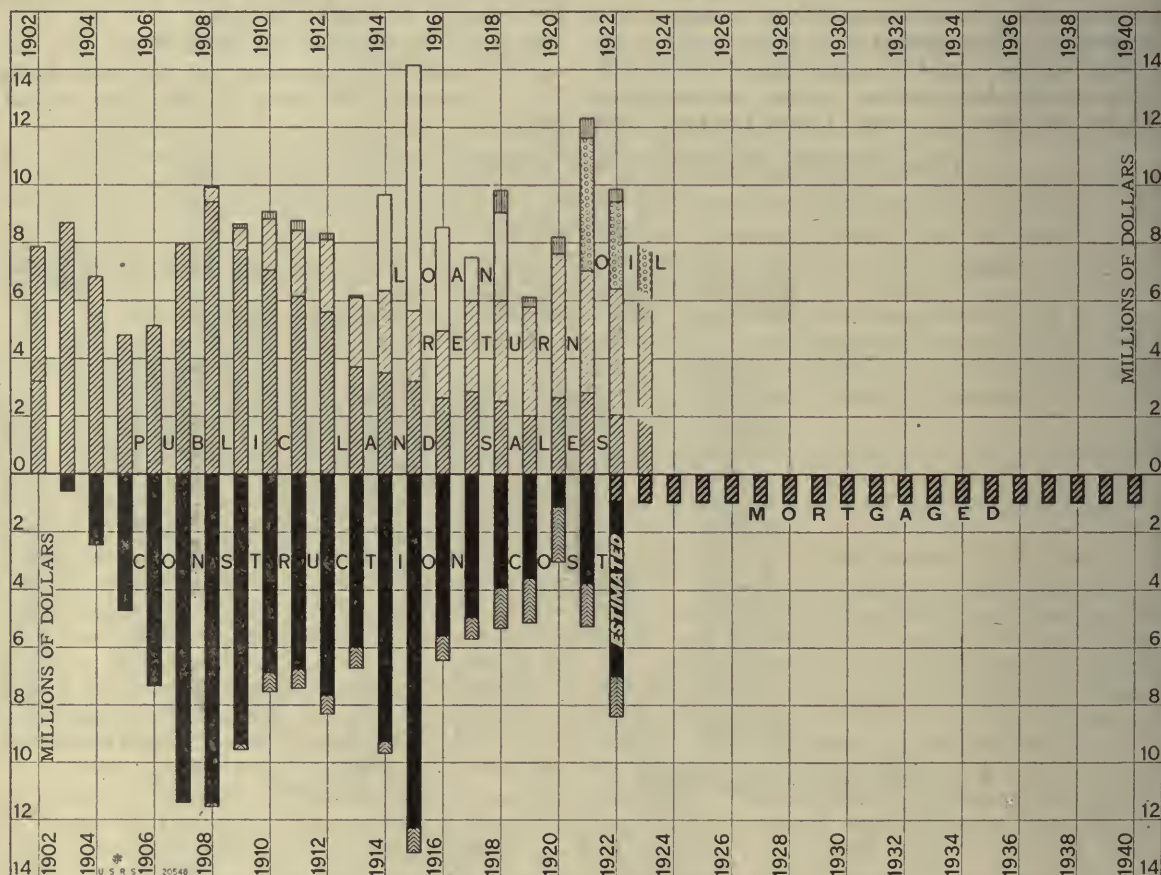


FIG. 1. Funds received from all sources, turnover, construction cost, construction repayments, and bond-loan mortgage, by years.

ury a balance sufficient to take care of outstanding obligations and emergencies. The net results of the 20 years' work ended June 30, 1922, are about as follows:

Net cost of irrigation works.....	\$135,977,000
Less amounts repaid.....	12,977,000
Balance of construction investment.....	123,000,000
Invested in secondary project investigations.....	1,277,000
Materials, supplies, and plant.....	3,000,000
Operation and maintenance.....	4,645,000
Estimated balance on hand June 30, 1922.....	3,000,000
Total.....	134,922,000

Table 2 gives by fiscal years the approximate net construction cost, the amounts repaid as applicable to this net cost, and the net construction investment.

TABLE 2.—Net construction by fiscal years and cash returns applicable thereto.

Year.	Net construction cost.		Collections.		Net construction investment by years.
	By years.	Cumulative total.	By years.	Cumulative total.	
1905 and prior.....	\$4,745,000				\$4,745,000
1906.....	7,291,000	\$12,036,000			7,291,000
1907.....	11,408,000	23,444,000			11,408,000
1908.....	11,574,000	35,018,000	\$53,000		11,519,000
1909.....	9,586,000	44,604,000		\$200,000	9,441,000
1910.....	7,507,000	52,111,000	603,000	\$803,000	6,904,000
1911.....	7,425,000	59,536,000	630,000	1,433,000	6,795,000
1912.....	8,311,000	67,847,000	624,000	2,057,000	7,687,000
1913.....	6,671,000	74,518,000	664,000	2,721,000	6,007,000
1914.....	9,736,000	84,254,000	361,000	3,082,000	9,375,000
1915.....	13,154,000	97,408,000	823,000	3,905,000	12,331,000
1916.....	6,469,000	103,877,000	809,000	4,714,000	5,660,000
1917.....	5,673,000	109,550,000	694,000	5,408,000	4,979,000
1918.....	5,301,000	114,851,000	1,365,000	6,773,000	3,696,000
1919.....	5,151,000	120,002,000	1,508,000	8,281,000	3,643,000
1920.....	3,288,000	123,290,000	1,875,000	10,156,000	1,413,000
1921.....	5,264,000	128,554,000	1,446,000	11,602,000	3,818,000
1922.....	7,423,000	135,977,000	1,375,000	12,977,000	6,048,000
Total.....	135,977,000		12,977,000		123,000,000

¹ Estimated.

Figure 1 indicates by the columns below the zero line the net construction cost and that portion of the construction cost which has been returned by the water users. The black part indicates that which has not been paid back or the net construction investment, while that portion of the columns at the end marked with chevron bars indicates the amount returned. The investments in secondary investigations, inventories, and operation and maintenance, are not diagrammed, as these are gradually absorbed in the construction cost as new projects are approved, as inventories are used, and as the investment in operation and maintenance is returned and re-expended in the construction of irrigation works. Thus it will be seen that of the total fund of \$134,922,000, 91.1 per cent is invested in the construction of irrigation works, about 1 per cent in investigations, about 2.2 per cent in inventories, about 3.5 per cent in operation and maintenance, and it is estimated that about 2.2 per cent will be on hand at the close of the present fiscal year.

As long as the work continues it will be necessary to retain a certain portion of the investment in inventories. The secondary investment increases as funds are expended for investigations as to the feasibility of projects and decreases as projects are approved and pass into the construction class.

The investment in operation and maintenance will continue until the management of the projects is transferred to the water users, as the cost is not billed to the water users until after the close of the season.

Figure 2 shows the sources of the reclamation dollar and how it has been invested.

Area Cropped and Investment (Fig. 3).

A comparison of the amount and character of crops by years and of the kind of investment made in the works

THE RECLAMATION DOLLAR

WHERE IT HAS COME FROM

ESTIMATED INVESTMENT AS OF JUNE 30, 1922

(CASH ON HAND \$3,000,000)

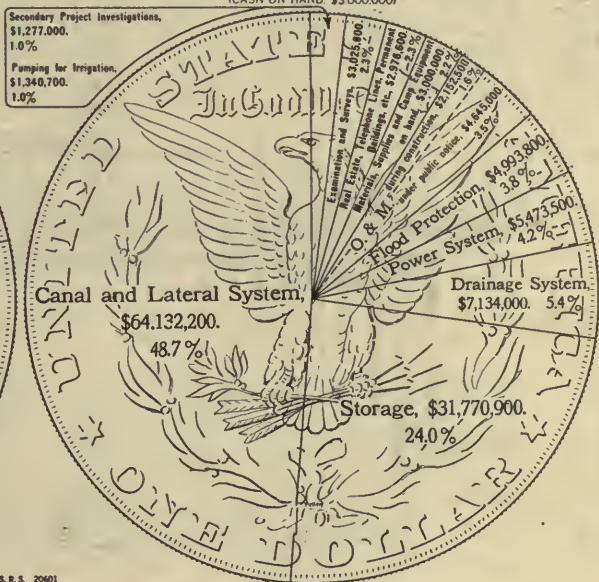
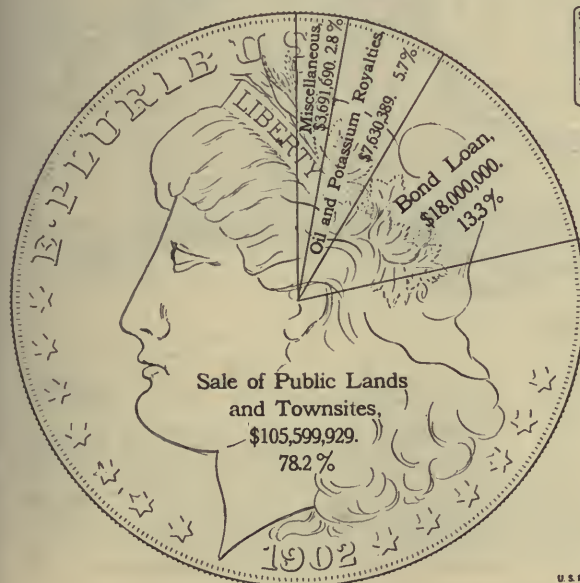


Fig. 2.—Sources and investment of the Reclamation Dollar.

built is given in Figure 3. Table 3 shows the progressive increase in irrigable acreage, irrigated acreage, cropped acreage, and crop value since 1913. These figures, it should be particularly noted, relate only to those areas on the reclamation projects proper which are covered by crop statistics, and do not include a large area receiving either a complete or partial water supply under the Warren Act from the irrigation works constructed by the Service. Including these areas, from which complete crop statistics are not secured by the Service, it is estimated that the value of crops produced in 1921 from areas served in whole or in part from the works of the Service amounted to nearly \$88,000,000.

TABLE 3.—Irrigable, irrigated, and cropped acreage, and crop value.

Year.	Irrigable acreage.	Irrigated acreage.	Cropped acreage.	Crop value.
1913	1,181,362	694,142	637,227	\$15,676,411
1914	1,240,875	761,271	703,424	16,475,517
1915	1,330,222	814,906	757,613	18,164,452
1916	1,405,452	922,821	838,291	32,815,972
1917	1,502,468	1,026,663	966,784	56,462,313
1918	1,601,934	1,119,566	1,051,193	66,821,396
1919	1,636,159	1,187,255	1,113,469	88,974,137
1920	1,661,960	1,225,480	1,133,820	66,171,650
1921 ¹	1,674,100	1,227,500	1,137,900	49,620,300
1922			1,200,000	53,000,000

¹ Estimated.

Investment.—The character and amount of investment is given in the lower half of Figure 2, below the zero line. The relative expenditures for storage, canal systems, laterals, etc., are indicated on the same scale as the value of crops produced in these years. Table No. 4 gives the estimated investment in each principal item, to June 30, 1922.

TABLE 4.—Estimated investment, by features.

	To June 30, 1922.
Secondary project investigations.....	\$1,277,000
Value of materials, supplies, and equipment on hand.....	3,000,000
Operation and maintenance.....	6,797,500
Examination and surveys.....	3,025,800
Storage.....	31,770,900
Pumping for irrigation.....	1,340,700
Canal and lateral system.....	64,132,200
Drainage system.....	7,134,000
Flood protection.....	4,993,800
Power system.....	5,473,500
Real estate, telephone lines, permanent buildings, etc.....	2,976,600
Total.....	131,922,000

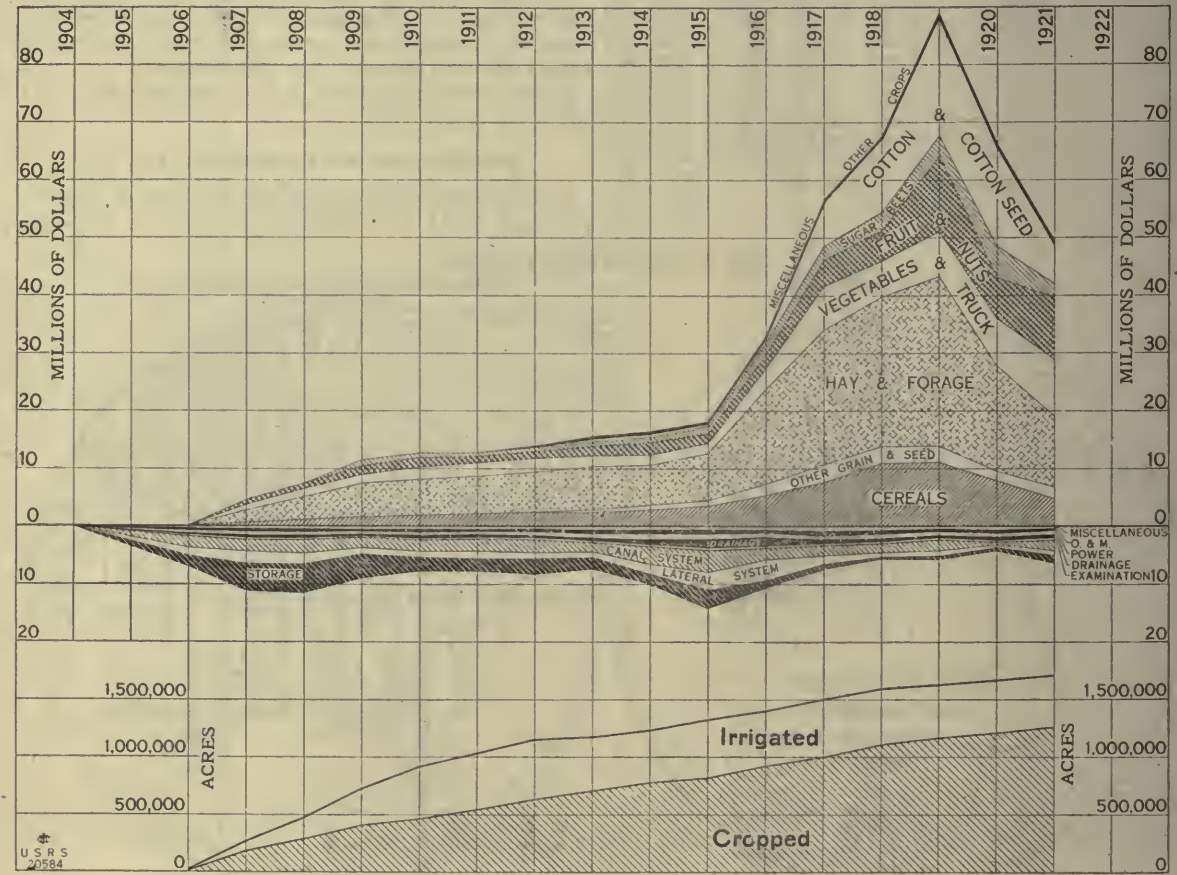


FIG. 3. Comparison of amount and character of crops and investment; also area irrigated and cropped, by years.

The character of crops in eight groups is shown in Table 5, which gives the acreage of each of these groups, the total value, and value per acre from 1913 to 1921, inclusive.

Total Annual Crop Production and Investment (Fig. 4).

Table 3 gives in the last column the gross value of crops per year from 1913 to 1922, the figures for the latter date being based on the assumed increase in the cropped area and crop values. In Figure 4 the annual gross crop re-

turns, in millions of dollars, are indicated by the height of the vertical columns above the zero line, and the annual net construction cost by the length of the columns below the zero line. The progressive increase in the cropped and irrigated acreages is shown at the bottom of the figure.

Cumulative Crop and Investment (Fig. 5).

Figure 5 is intended to bring out the relation between the gross value of the crops produced on the irrigated

TABLE 5.—Acreage cropped and crop value, by specified crops, 1913-1921.

Crop.	1913			1914			1915			1916		
	Acreage cropped.	Crop value.		Acreage cropped.	Crop value.		Acreage cropped.	Crop value.		Acreage cropped.	Crop value.	
		Total.	Average per acre.		Total.	Average per acre.		Total.	Average per acre.		Total.	Average per acre.
Cereals.....	185,833	\$2,576,146	\$13.87	183,756	\$2,984,521	\$16.00	211,605	\$3,566,160	\$17.00	223,555	\$5,288,966	\$24.00
Other grain and seed.....	20,105	402,632	20.02	34,100	589,251	17.00	27,844	840,292	30.00	37,989	1,086,186	29.00
Hay and forage.....	391,788	7,631,230	19.55	444,300	7,351,894	16.50	487,825	8,317,810	17.00	572,261	16,385,644	29.00
Vegetables and truck.....	33,437	2,161,519	64.64	33,450	1,974,651	59.00	31,963	2,183,341	68.00	29,743	3,896,626	131.00
Fruits and nuts.....	13,406	1,481,552	110.51	19,826	1,900,391	96.00	25,927	1,647,509	63.00	32,825	2,761,852	84.00
Sugar beets.....	14,859	772,454	52.00	12,753	722,349	57.00	20,848	1,236,049	59.00	29,328	1,881,449	64.00
Cotton and cotton seed.....	6,117	383,960	62.76	15,072	825,055	55.00	3,325	204,671	62.00	20,815	1,292,583	.....
Miscellaneous other crops.....	17,722	266,918	15.06	2,201	177,405	.....	3,291	168,620	.....	3,346	222,716	.....
Duplication.....	46,040	.....	.....	42,034	.....	.....	55,015	.....	.....	91,571	.....	.....
All crops, total.....	637,227	15,676,411	24.60	703,424	16,475,517	23.50	757,613	18,164,452	24.00	858,291	32,815,972	38.25

Crop.	1917			1918			1919		
	Acreage cropped.	Crop value.		Acreage cropped.	Crop value.		Acreage cropped.	Crop value.	
		Total.	Average per acre.		Total.	Average per acre.		Total.	Average per acre.
Cereals.....	235,057	\$7,964,263	\$34.00	279,673	\$11,120,064	\$39.60	289,242	\$11,465,591	\$39.64
Other grain and seed.....	56,932	2,541,818	45.00	47,793	2,943,264	61.60	47,796	2,835,218	59.32
Hay and forage.....	556,664	23,719,480	43.00	580,200	25,757,454	44.40	614,774	28,778,832	47.00
Vegetable and truck.....	59,293	7,516,773	127.00	51,294	6,146,733	120.00	50,689	7,961,327	157.06
Fruit and nuts.....	37,738	4,717,702	125.00	37,979	5,323,267	140.00	41,464	12,776,510	308.13
Sugar beets.....	32,924	2,275,338	69.00	27,133	2,731,871	101.00	37,964	3,805,379	100.24
Cotton and cotton seed.....	40,166	7,391,383	184.00	86,470	12,193,480	141.00	107,390	20,892,325	194.54
Miscellaneous other crops.....	6,365	335,556	.....	21,126	605,263	.....	20,046	458,952	.....
Duplication.....	58,355	.....	.....	80,475	.....	.....	95,896	.....	.....
All crops, total.....	966,784	56,462,313	58.00	1,051,193	66,821,396	63.60	1,113,469	88,974,137	79.88

Crop.	1920			1921			1913 to 1921.		
	Acreage cropped.	Crop value.		Acreage cropped.	Crop value.		Acreage cropped.	Crop value.	
		Total.	Average per acre.		Total.	Average per acre.		Total.	Average per acre.
Cereals.....	255,412	\$8,056,848	\$31.55	299,639	\$5,036,215	\$16.80	2,163,772	\$58,008,774	\$26.81
Other grain and seed.....	38,437	1,500,066	39.00	67,542	1,741,357	25.78	378,538	14,480,084	38.25
Hay and forage.....	582,026	18,531,413	32.00	631,829	12,268,567	19.42	4,861,667	148,742,324	30.59
Vegetables and truck.....	51,524	7,769,219	150.79	74,904	10,164,121	135.70	416,297	49,774,310	119.56
Fruit and nuts.....	39,657	7,511,300	189.44	40,505	10,545,647	260.35	289,327	48,665,730	168.20
Sugar beets.....	47,160	5,486,251	116.33	40,895	2,690,001	66.00	263,864	21,601,141	81.86
Cotton and cotton seed.....	222,216	16,846,414	75.90	102,087	6,688,195	65.51	603,658	66,718,019	110.52
Miscellaneous other crops.....	7,006	470,139	.....	10,221	486,197	.....	91,324	3,191,766	34.95
Duplication.....	89,618	.....	.....	109,722	.....	.....	668,726	.....	.....
All crops, total.....	1,153,820	66,171,650	57.35	1,157,900	49,620,300	42.85	8,399,721	411,182,148	48.95

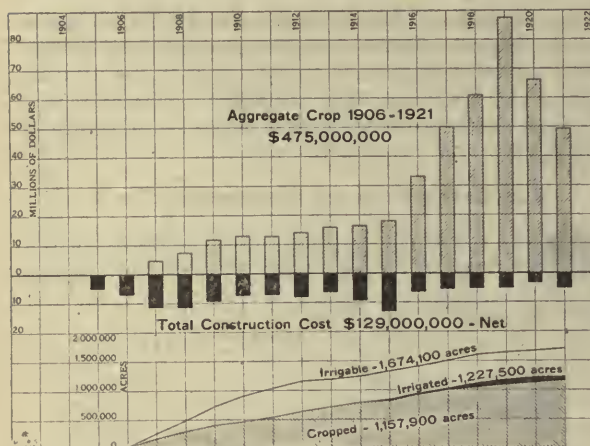


FIG. 4. Annual crop values, annual net construction cost irrigable, irrigated, and eropped acreage.

land and the net Government investment which has made this crop production possible. The aggregate value of all crops produced on the reclamation projects, up to and including 1921, is approximately \$475,000,000 (see Table 6), as compared with the net construction cost of the works to the end of the fiscal year 1921 of a little less than \$129,000,000 (see Table 2).

The rate at which the investment made has been returned is indicated by the black line immediately below the zero line. This return should steadily increase in volume and gradually overtake the line of investment, wiping out the debt to the Government.

It should be noted that not all of the investment in building works is as yet being put to full use so far as the land is concerned, because of the fact that there has been for several years an aggregate of about 400,000 acres (the difference between the acreage irrigated and the acreage for which the service was prepared to supply water)

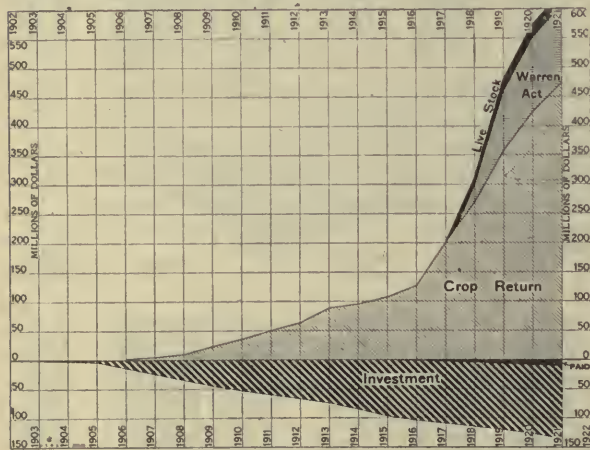


FIG. 5. Cumulative values of crops and live stock, net construction cost, and amount repaid.

scattered in thousands of pieces which have not been put to the highest use in crop cultivation, or otherwise productively utilized. Probably the most complete use of the irrigable area to be ultimately expected will show the irrigation of 80 to 90 per cent.

TABLE 6.—Estimated value of crops grown on United States reclamation projects.

Year.	Value.	Cumulative value.
1906.....	\$244,900	
1907.....	4,760,400	\$5,005,300
1908.....	7,575,800	12,581,100
1909.....	11,920,700	24,501,800
1910.....	12,974,600	37,476,400
1911.....	12,708,600	50,185,000
1912.....	13,825,400	64,010,400
1913.....	15,676,400	79,686,800
1914.....	16,475,500	96,162,300
1915.....	18,164,500	114,326,800
1916.....	32,816,000	147,142,800
1917.....	56,462,300	203,605,100
1918.....	66,821,400	270,426,500
1919.....	88,974,100	359,400,600
1920.....	66,171,700	425,572,300
1921.....	49,620,300	475,192,600
Total.....	475,192,600	

Warren Act lands.—A portion of the net construction cost shown in Table 2 has been expended in building storage works which have been used in part for the lands watered under the terms of the reclamation act and in part for other lands to which water is diverted or sold under the terms of the Warren Act of February 21, 1911, which authorizes the Government to contract for impounding, storage, and carriage of water for irrigation systems operating under the Carey Act, or for individuals, corporations, associations, and irrigation districts engaged in distributing water for irrigation. The crops grown on these lands dependent upon the storage works built by the reclamation fund aggregate about three-fifths of the gross crop value on the projects as indicated in Table 7.

TABLE 7.—Other lands served by Government works, usually a partial water supply through private canals under Warren Act contracts.

Year.	Irrigable acreage.	Irrigated acreage.	Cropped acreage.	Crop value.	
				Total.	Average per acre.
1918.....				\$35,000,000	
1919.....	1,011,815	916,313	880,613	64,004,750	\$72.70
1920.....	1,183,292	981,940	950,890	47,505,770	50.00
1921.....				138,200,000	

¹ Estimated.

Live stock.—The gross crop values given in Table 3, column 4, for lands on the reclaimed projects, and also those given in Table 7, do not include all of the values derived from the irrigated lands. In addition to these,

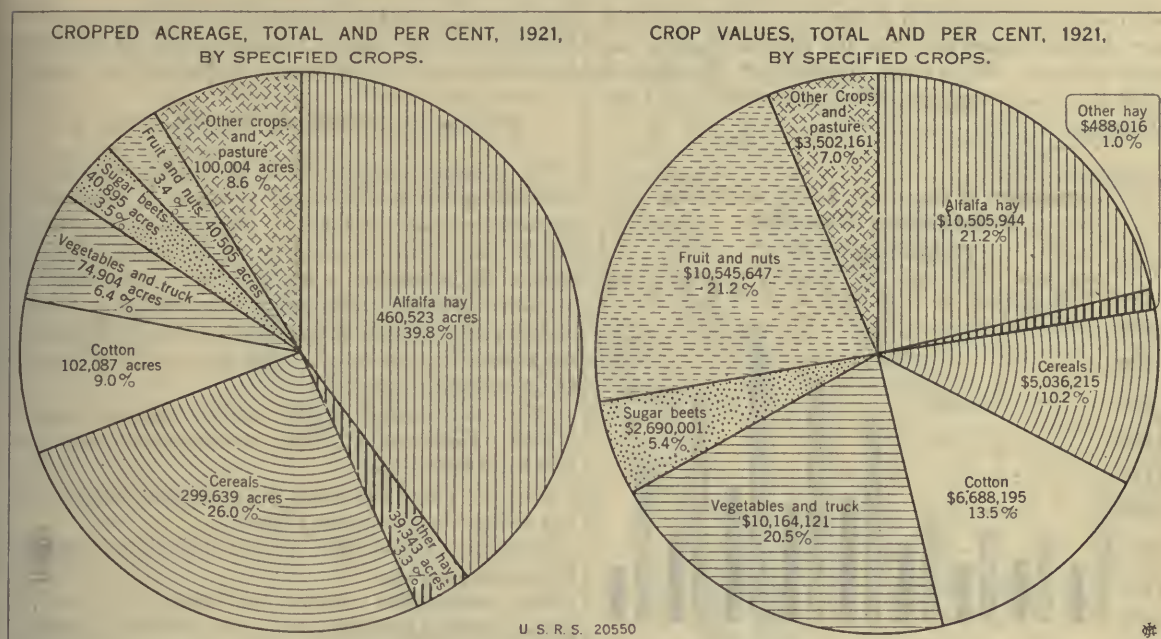


FIG. 6. Cropped acreage and crop values, total and per cent, 1921.

there is an annual increase in live stock, the value of which is indicated in Table 8.

The heavier forage crops, notably alfalfa, and many of the cereals are fed on the farm, with corresponding increase in beef and dairy cattle, hogs, sheep, and poultry. The value of live stock has been estimated as about one-third of the gross crop production. The aggregate value in 1921 has been placed at about \$15,000,000.

TABLE 8.—Live stock, number and value at close of year.

Item.	1918	1919	1920	1921
Horses:				
Number.....		85,910	85,967	
Value.....		\$7,631,980	\$7,331,453	
Mules:				
Number.....		7,336	8,855	
Value.....		\$1,058,783	\$922,302	
Beef cattle:				
Number.....		98,461	86,854	
Value.....		\$6,341,248	\$4,610,041	
Dairy cattle:				
Number.....		60,241	43,989	
Value.....		\$4,898,493	\$3,446,477	
Sheep:				
Number.....		240,619	148,464	
Value.....		\$2,348,565	\$1,176,004	
Hogs:				
Number.....		134,229	105,238	
Value.....		\$2,220,600	\$1,403,261	
Fowls:				
Number.....		1,168,915	1,178,441	
Value.....		\$1,085,205	\$1,180,604	
Bees (hives):				
Number.....		48,410	46,001	
Value.....		\$427,239	\$404,519	
Total stock value.....	\$23,409,268	\$26,011,153	\$20,476,146	\$15,000,000

¹ Estimated.

Crop Acreage and Values, 1921 (Figs. 6 and 7).

Figure 6 illustrates the relative area and value of the crops, classified under seven headings. The largest area, 460,523 acres, or nearly 40 per cent of the entire area cropped, was devoted to alfalfa hay, having a total value of \$10,505,944, or a little over 21 per cent of the entire crop value for 1921.

TABLE 9.—Cropped acreage and crop value, by specified crops, 1921.

Specified crops.	Acreage.		Value.	
	Total.	Per cent.	Total.	Per cent.
Alfalfa hay.....	460,523	39.8	\$10,505,944	21.2
Other hay.....	39,343	3.3	488,016	1.0
Cereals.....	299,639	26.0	5,036,215	10.2
Cotton.....	102,087	9.0	6,688,195	13.5
Vegetables and truck....	74,904	6.4	10,164,121	20.5
Sugar beets.....	40,895	3.5	2,690,001	5.4
Fruit and nuts.....	40,505	3.4	10,545,647	21.2
Other crops and pasture..	100,004	8.6	3,502,161	7.0
Total.....	1,157,900	100.0	49,620,300	100.0

Next in importance in value, but far less in area, are the fruits, including apples, prunes, peaches, and other deciduous fruits, and also oranges, grape fruit, lemons, and other citrus varieties, as well as nuts, particularly almonds. These occupy only 3.4 per cent of the area cropped but contributed to the crop values as much as the alfalfa hay. In comparing these results for 1921 with the crop returns

for other years, as indicated in figure 3, it is seen that the more striking change has been the decrease in area and value of cotton, with a steady increase of what may be called the more permanent crops—fruit, nuts, and vegetables.

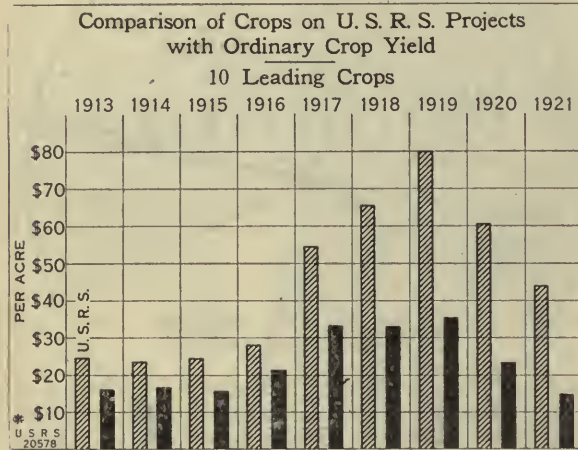


FIG. 7. Comparison of value of crops per acre grown on Reclamation Service projects and of ten leading crops for the United States as a whole.

Crop values per acre.—Figure 7 gives a graphical comparison of the average gross value per acre of crops (see Table 5), not including live stock, on the projects built under the terms of the reclamation act in comparison with the average crop value per acre of 10 leading crops for the United States as a whole for the corresponding years, as given by the Department of Agriculture, volume 1, page 20, Weather, Crops, and Markets, January 14, 1922. The vertical crosshatched bars give the average crop values per acre on the reclamation projects, and for comparison with these is given the average value per acre of 10 leading crops. This indicates that the crop values per acre from the reclamation projects beginning in the year 1913 were about a third larger, in 1919 they were over twice as large, and in 1921 the divergence was still greater.

TABLE 10.—Average crop value per acre.

Year.	10 leading crops.	United States Reclamation Service projects.	Year.	10 leading crops.	United States Reclamation Service projects.
1913.....	\$16.49	\$24.60	1918.....	\$33.73	\$63.60
1914.....	16.44	23.50	1919.....	35.74	79.88
1915.....	17.18	24.00	1920.....	23.26	57.35
1916.....	22.58	38.25	1921.....	14.52	42.85
1917.....	33.27	58.00	1913-1921.....		48.95

The census for 1920 gives 78 acres as the improved acreage per farm. If improved acreage yielded only \$14.52 per

acre in 1921, the crop earnings of the average farm in the United States were only \$1,132.56 as contrasted with \$1,714 for the 40-acre reclaimed farm of the Reclamation Service.

Success of the Ordinary Irrigator (Fig. 8).

The average condition of all the irrigators on the reclamation projects is illustrated by Figure 8. Each of the vertical lines may be taken as representing one irrigator out of 100, or 300 irrigators out of the entire number of 30,000. It is based on a study of the returns, classified, as indicated below, according to whether the individual or group he represents obtains crop returns above or below the average for his locality. (See RECLAMATION RECORD, October, 1921, p. 452.)

Poor.—A crop yield less than half the project average.

Fair.—A crop yield less than the project average but at least half the average.

Good.—A crop yield equal to the average, but less than one and one-half times the average.

Excellent.—A crop yield one and one-half or more times the project average.

This classification indicates that, taking all of the irrigators, about 18,000 from whom returns were received, 18 per cent of these obtained relatively poor crops, 35 per cent had fair crops, another 35 per cent good crops, and 12 per cent excellent crops.

Figure 8 indicates in a general way the distribution of irrigators under the conditions which have prevailed.

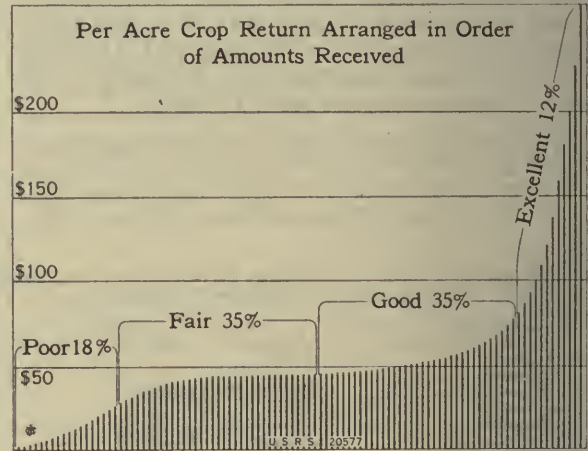


FIG. 8. Classification of water users on basis of crop return.

As excellent, are grouped the good farmers on good land who have had good luck in producing and marketing their crops. The success of some of these has been phenomenal and crop yields running up into hundreds of dollars per acre have been reported. These instances, true in themselves, of course, are not representative, but merely indicative of what has actually been accomplished under an unusual combination of circumstances. They serve total-

tract and stimulate other men, as does the award of prizes in any contest or competition.

TABLE 11.—Status of water users, 1920, on United States Reclamation Service projects.

Project.	Total number of water users producing crops.	Number of water users whose crop yields per acre were—			
		Poor (less than half the project average).	Fair (half the project average, but less than the average).	Good (the project average, but less than one and one-half times the average).	Excellent (one and one-half or more times the project average).
Yuma.....	1,230	176	425	545	84
Orland.....	644	200	300	120	24
Grand Valley.....	366	36	172	107	51
Uncompahgre.....	1,588	277	645	329	337
King Hill.....	117	15	42	43	17
Minidoka:					
South Side Pumping.....	915	91	421	284	119
Huntley.....	601	151	255	110	85
Milk River.....	229	67	56	51	55
Sun River:					
Fort Shaw Division.....	203	28	72	81	22
Greenfields Division.....	150	57	41	44	8
Lower Yellowstone.....	492	108	159	138	87
North Platte:					
Interstate Division.....	1,325	510	349	198	268
Carlsbad.....	363	72	191	74	26
Rio Grande.....	2,998	610	1,268	807	313
North Dakota Pumping.....	94	22	34	29	9
Umatilla.....	493	66	175	188	64
Klamath.....	513	34	72	296	111
Okanogan.....	367	154	79	55	79
Yakima-Sunnyside.....	2,905	145	435	2,180	145
Yakima-Tieton.....	1,340	212	559	396	173
Shoshone.....	910	199	344	273	94
Total.....	17,843	3,230	6,094	6,348	2,171
Per cent.....	100.0	18.1	34.1	35.6	12.2

¹ Exclusive of Chinook Division; data based on value per acre of irrigated crops.

The great body of irrigators, however, fall into the two classes of good and fair, and include 70 per cent of the men who are farming the reclaimed area. This 70 per cent makes the solid foundation upon which the prosperity of the country is based. Very little is said about them. They are working hard, undergoing the discomforts of pioneering, getting good crops, and building up the prosperity of the community. During the time of inflated prices most of them stretched their credit to the utmost in purchasing additional land, equipment, or providing the necessities for the farm and family. In looking back most of them appreciate that they would have been better off had they not gone into debt for things which they find they could have gotten along without, but in this respect they did not differ from the farmers of other States. The upper half of this 70 per cent, namely, the farmers classed as good, includes the great body of men who may be considered as good farmers, but have not been able to obtain especially good land. On the other hand, in the lower half, those



FIG 9. Principal irrigation projects constructed and under construction by the U. S. Reclamation Service.

classed as fair are many of the poorer farmers who have been unfortunate in being unable to get good land.

The families, including 18 per cent of the whole, who are classed as poor, are those to whom the greatest consideration must necessarily be given. They are composed largely of poor farmers, that is, men with lack of skill or strength who have located on poor land and have had bad luck. The bad luck may have come from a hailstorm or incursion of grasshoppers or other pests. It may be the result of sickness or of unwise investment in livestock or implements, which did not turn out as expected.

As a rule, it may be said that the poor farmer almost invariably selects a poor farm, or is forced by conditions to take one. The good farmer if by chance he gets a poor piece of land will strive in every way to get rid of it, as he would an unproductive dairy cow. He usually succeeds, and the poor land ultimately gets into the hands of the inexperienced man who takes it because it is cheap.

In this connection, however, it should be noted that the terms "poor," "fair," "good," and "excellent," are relative; that is, if the value of crops per acre for a project or for all the projects as a whole is high, the farmers classified as "poor" or receiving a return less than half the project average, might still receive a fairly good return. This is brought out by a comparison of the average crop value per acre on the Reclamation Service projects of \$42.85 in

1921, as compared with the average value per acre of 10 leading crops for the United States as a whole in the same year of only \$14.52. A so-called "poor" farmer on the Reclamation Service projects would still have received a gross return in that year probably equal to or greater than that of the average farmer in the United States.

Differing Conditions on Projects (Figs. 9 and 10).

In what has been stated before general conditions which relate to all the projects as a whole have been discussed. The projects, however, differ among themselves in climate, soil, markets, and other conditions from the highly productive, semitropic lands at Yuma near the mouth of the Colorado River, to the cold, northern short seasons of Montana. The position of these is shown by the small accompanying map marked Figure 9.

Figure 10 (back page) gives in horizontal lines the original investment in the work, the amount repaid, and

TABLE 12.—*Acreage cropped, United States Reclamation Service, 1917-1921.*

State and project.	Acreage cropped.				
	1917	1918	1919	1920	1921
Arizona:					
Salt River.....	188,500	184,432	188,232	193,350	191,000
Arizona-California:					
Yuma.....	35,578	45,049	52,324	54,480	52,400
California:					
Orland.....	9,608	12,075	12,409	11,040	11,450
Colorado:					
Grand Valley....	4,523	6,387	8,899	10,760	11,390
Uncompahgre....	52,717	57,310	59,746	63,730	63,600
Idaho:					
Boise.....	88,732	90,720	99,093	100,700	103,340
King Hill.....		1,677	3,959	4,520	5,390
Minidoka.....	92,456	98,182	98,848	98,580	100,720
Montana:					
Huntley.....	19,105	19,262	19,310	20,020	18,440
Milk River.....	10,893	23,800	24,099	22,330	16,110
Sun River.....	7,445	7,832	11,194	16,350	21,090
Montana-North Dakota:					
Lower Yellowstone.....	15,659	21,000	21,289	19,120	19,980
Nebraska-Wyoming:					
North Platte....	80,760	99,310	102,300	103,690	110,410
Nevada:					
Newlands.....	39,236	41,490	43,296	44,570	43,440
New Mexico:					
Carlsbad.....	15,729	18,200	18,753	20,180	21,620
New Mexico-Texas:					
Rio Grande.....	63,626	64,002	72,170	77,880	77,660
North Dakota:					
North Dakota pumping.....			2,370	2,740	1,960
Oregon:					
Umatilla.....	5,546	6,819	8,464	10,190	11,610
Oregon-California:					
Klamath.....	32,929	32,127	32,688	35,260	32,720
South Dakota:					
Belle Fourche....	50,026	52,445	56,255	59,850	55,100
Utah:					
Strawberry Valley.....	25,620	29,788	29,255	29,250	31,380
Washington:					
Okanogan.....	6,314	5,287	5,314	4,920	5,330
Yakima.....	90,223	96,310	102,186	106,190	107,880
Wyoming:					
Shoshone.....	31,554	37,689	41,016	44,120	43,880
Total.....	966,784	1,051,193	1,113,469	1,153,820	1,157,900

the annual gross crop value for the years 1917-1921, inclusive. The acreage cropped, gross crop value, and crop value per acre, by projects, 1917-1921 are given in Tables 12, 13, and 14.

The notable fact is that on some of these projects, such as Salt River, Ariz., and Yakima, Wash., the annual crop production has equaled or exceeded the original cost of the works, whereas in the case of others in the north, where hay and grain are the principal crops, or where development has proceeded very slowly, the annual crop return is half, or a quarter, or even less, of the investment made by the Government. It is to be noted that in the case of these projects the lands are not yet fully utilized, and in many instances there is still a large amount of what is known as excess land.

NOTE.—This discussion will be continued in succeeding issues of the RECLAMATION RECORD.

TABLE 13.—*Gross crop value, United States Reclamation Service, 1917-1921.*

State and project.	Gross crop value.				
	1917	1918	1919	1920	1921
Arizona:					
Salt River.....	\$13,692,000	\$18,188,800	\$23,768,682	\$18,551,800	\$11,435,380
Arizona-California:					
Yuma.....	3,752,669	5,105,132	7,012,209	3,328,500	2,098,000
California:					
Orland.....	543,570	709,172	892,259	549,700	495,810
Colorado:					
Grand Valley....	198,960	414,310	570,629	525,360	356,730
Uncompahgre....	3,051,668	3,302,460	3,391,456	3,397,500	2,614,300
Idaho:					
Boise.....	4,386,545	5,154,646	6,254,904	4,653,400	4,203,940
King Hill.....		45,588	219,246	216,500	119,210
Minidoka.....	5,119,043	5,168,078	5,926,259	4,047,200	3,409,280
Montana:					
Huntley.....	690,830	750,963	948,968	543,780	440,770
Milk River.....	208,335	408,716	600,864	332,200	129,830
Sun River.....	219,130	245,852	372,636	293,600	290,380
Montana-North Dakota:					
Lower Yellowstone.....	459,557	669,191	869,117	584,700	304,220
Nebraska-Wyoming:					
North Platte....	3,385,060	3,475,589	4,423,821	4,679,280	2,962,730
Nevada:					
Newlands.....	1,450,480	1,626,142	1,840,650	1,279,640	1,254,580
New Mexico:					
Carlsbad.....	623,818	1,105,515	1,988,546	963,800	919,650
New Mexico-Texas:					
Rio Grande.....	3,598,424	4,237,020	3,825,107	4,639,200	2,493,710
North Dakota:					
North Dakota pumping.....			69,990	56,780	51,320
Oregon:					
Umatilla.....	311,335	400,642	633,380	519,470	343,890
Oregon-California:					
Klamath.....	847,200	929,131	859,805	904,500	431,950
South Dakota:					
Belle Fourche....	1,171,239	1,276,115	1,962,683	832,200	513,750
Utah:					
Strawberry Valley.....	1,290,745	1,642,327	1,973,059	1,945,900	1,020,590
Washington:					
Okanogan.....	616,640	749,982	1,951,475	431,200	2,051,270
Yakima.....	9,783,825	9,729,643	16,731,415	11,801,800	10,963,410
Wyoming:					
Shoshone.....	1,061,180	1,486,382	1,886,977	1,063,640	712,540
Total.....	56,462,313	66,821,396	88,974,137	66,171,650	49,620,300

TABLE 14.—*Gross crop value per acre, United States Reclamation Service, 1917-1921.*

State and project.	Gross crop value per acre.				
	1917	1918	1919	1920	1921
Arizona:					
Salt River.....	\$72.60	\$98.70	\$126.27	\$96.00	\$60.00
Arizona-California:					
Yuma.....	105.47	113.32	134.00	61.09	40.04
California:					
Orland.....	56.57	58.73	71.90	49.80	43.30
Colorado:					
Grand Valley.....	44.00	64.87	64.12	48.80	31.32
Uncompahgre.....	57.89	57.62	56.76	53.30	41.10
Idaho:					
Boise.....	49.44	56.80	63.12	46.20	40.68
King Hill.....		27.18	55.39	47.90	22.12
Minidoka.....	55.15	52.64	59.95	41.05	33.85
Montana:					
Huntley.....	36.16	39.00	49.14	27.10	23.90
Milk River.....	19.13	17.17	24.93	14.90	8.06
Sun River.....	29.43	31.39	33.30	17.95	13.77
Montana-North Dakota:					
Lower Yellowstone.....	29.35	31.85	40.82	30.60	15.23
Nebraska-Wyoming:					
North Platte.....	41.92	35.00	43.24	45.12	26.83
Nevada:					
Newlands.....	51.36	53.15	56.59	28.70	28.88
New Mexico:					
Carlsbad.....	39.66	60.74	106.04	47.75	42.53
New Mexico-Texas:					
Rio Grande.....	56.50	66.20	53.00	59.60	32.11
North Dakota:					
North Dakota pumping.....			29.53	31.70	27.71
Oregon:					
Umatilla.....	56.15	58.75	74.83	50.00	29.62
Oregon-California:					
Klamath.....	25.73	28.92	26.30	25.65	13.20
South Dakota:					
Belle Fourche.....	23.50	24.36	34.89	13.90	9.32
Utah:					
Strawberry Valley..	50.37	55.13	67.50	66.50	32.11
Washington:					
Okanogan.....	96.88	141.85	367.23	87.70	334.85
Yakima.....	108.43	101.02	163.74	111.14	101.62
Wyoming:					
Shoshone.....	33.63	39.44	46.01	24.11	16.24
Total.....	58.00	63.60	79.88	57.35	42.85

Dairy Cows Increase Value of Alfalfa Hay.

Mr. L. E. Cline, Government agriculturist on the Newlands project, has recently compiled definite figures on the cost of producing alfalfa hay in 1921 on the Newlands project. His study shows an average total cost per ton of \$9.91 in the production of alfalfa hay on the 465 acres of alfalfa represented in the six farms studied. Mr. Cline states that it is evident that the alfalfa grower who was obliged to seek a market outside the project failed to realize any net profit from his operations.

He points out, however, that the average returns from 19 dairy herds on the project showed an average gross return of \$28.40 per ton of hay used, and concludes that although it may not be possible to reduce materially the cost of producing alfalfa hay, it is gratifying to know that it is possible through the use of dairy cattle to secure a more profitable market than is generally found by exporting the hay to distant points.

The above recalls to mind Mr. I. D. O'Donnell's slogan: Raise all you feed and feed all you raise.

The Engineering Library of the United States Reclamation Service.

During the past 20 years the service has collected a large amount of engineering and cost data in connection with the investigation, construction, and operation of the large number of irrigation projects in the West. Much of these data were obtained as a result of pioneer work having to do with the construction of the immense dams, the control of water under high heads, and the problems resulting therefrom.

As the Reclamation Service is not a publishing bureau in the sense that many of the other bureaus of the departments are, and furthermore as all expenditures are required by law to be returned by the water users to the reclamation fund in small annual installments, it has not been possible to make available to the public much of this material.

Each year, however, the managers of the various projects compile histories of the year's work and these are filed in manuscript form in the engineering section of the Washington office for reference purposes. There are now about 1,000 of these volumes of data.

In addition to these manuscript reports there has been acquired a small selected list of standard works on irrigation and allied subjects of about 500 volumes. There is also included in this reference library a file of bound volumes of the engineering periodicals, Water Supply Papers of the United States Geological Survey, soil reports, and other reports of the Department of Agriculture, biennial reports of State engineers, and reports of State agencies of investigations in regard to development of unused lands.

The library now contains about 7,000 books and pamphlets, and card indexes are maintained not only of the volumes but of the articles appearing in the technical periodicals relating to the work of the service, and the several card indexes now include over 12,000 cards.

Effort is being made to secure as complete information as possible on the subjects of irrigation, drainage, and allied topics, or to the sources from which that information can be obtained, for the use of our engineers and others interested in the development of our unused lands and the agricultural resources of the country.

During 1916 there were shipped from the Newlands project approximately \$20,000 worth of hogs. A concerted effort on the part of the project farmers could bring the 1922 revenue from hogs to this figure.

The alfalfa acreage on the Newlands project in 1920 was 70.2 per cent of the acreage planted to the four principal crops of alfalfa, barley, wheat, and potatoes. In 1921 it had increased to 89.5 per cent. The answer to this marketing problem is dairying and hog raising.

IRRIGATION HAS HELPED MATERIALLY IN PRODUCING THESE RESULTS.

Yuma Project, Arizona-California.

Values created.

Value of farm lands and improvements on project at close of 1921.....	\$10,240,000
Value of live stock.....	665,000
Value of farm equipment.....	450,000
	<hr/>
	11,355,000

Assessed valuations.

Towns.....	\$4,600,000
Farms.....	6,185,000
Public utilities.....	4,615,000
	<hr/>
	15,400,000

Value of crops produced in 1921.

Alfalfa hay.....	\$430,000
Alfalfa seed.....	478,000
Cotton.....	798,000
Cotton seed.....	60,000
Miscellaneous.....	332,000
	<hr/>
	2,098,000

Value of crops produced since 1916.....	23,000,000
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Shipments of agricultural products, 1921.

	Carloads.
Hay.....	621
Cotton.....	425
Cotton seed, cottonseed oil and cake.....	208
Manure.....	137
Cattle.....	121
Alfalfa seed.....	65
Honey.....	13
Miscellaneous.....	38
	<hr/>

Total amount shipment.....	1,628
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Wholesale purchases of manufactures during 1921.

Dry goods, clothing, shoes.....	\$980,000
Lumber.....	375,000
Automobiles, trucks, etc.....	133,000
Groceries.....	2,150,000
Hardware.....	320,000
Coal, feed, flour, bags, etc.....	225,000
Farm implements.....	205,000
Machinery and supplies.....	175,000
Electrical supplies.....	105,000
Jewelry and miscellaneous instruments.....	50,000
Drugs and sundries.....	265,000
Cigars, etc.....	104,000
Furniture.....	124,000
Other merchandise.....	200,000
	<hr/>

Total.....	5,411,000
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Other significant statistics, 1921.

Number of farms.....	1,211
Number of towns.....	6
Population.....	5,500
Acres supplied with water.....	52,400
Acres in crop.....	52,400
Public schools.....	16
Churches.....	23
Newspapers.....	3
Banks.....	5
Capital stock.....	\$230,000
Deposits.....	\$1,927,000
Number of depositors.....	9,200
Industries:	
Cotton gins.....	10
Creamery.....	1
Cheese factory.....	1
Cement pipe works.....	2
Broom factory.....	1
Barley roller.....	1
Railroads, miles.....	52

King Hill Project, Idaho.

The King Hill project was originally constructed by private capital under the Carey Act. Owing to the type of construction an adequate supply of water was never delivered to the land owners, and on December 17, 1917, the United States Reclamation Service entered into a contract with the irrigation district to reconstruct the system. Under the terms of the contract the district is to return to the reclamation fund the cost of such reconstruction.

On May 18, 1921, the operation and maintenance of the project was turned over to the Reclamation Service under a contract ratified by the land owners. Prior to this time no detailed records were maintained by the district as to the amount of water delivered or results accomplished.

The project, when completed, will embrace 16,885 acres of irrigable land. During the season of 1921 of this acreage there were irrigated and cropped 5,908 acres, or about one-third of the ultimate area to be farmed. Of the total area there was about 30 per cent for which the service had not as yet completed the distributing system. The small area cultivated during 1921 was due mainly to the fact that the water users had not up to this time received an adequate water supply and did not feel justified in again putting in crops without an assurance of ample water for the proper irrigation of their land. Of the 160 farms which were cropped during the season 141 were farmed by the owners of the land.

Notwithstanding the handicaps under which the farmers have heretofore been working they have created values more than ample to protect the Government in its investment, as will be seen from the following tabulation of results accomplished as shown by the 1921 crop reports:

Value of farm lands and improvements estimated by owners at the close of 1921.....	\$1, 336, 015
Value of live stock.....	171, 338
Value of farm equipment.....	55, 255
Assessed valuation of town property and merchandise.....	600, 000
Bank deposits.....	372, 000
Value of crops produced, season of 1921.....	119, 216

It should be borne in mind that the above crop reports and values covered but one-third of the project lands, and also that the prices obtained for all farm products were considerably below normal.

In consideration of the conditions obtaining on this project it is thought that the farmers here made a very creditable showing during the past year.

North Dakota Pumping Project, Williston Division.

Values created.

Value of farm lands and improvements on project, estimated by the water users at the close of 1921.....	\$368, 000
Value of live stock.....	75, 000
Value of farm equipment.....	30, 000
Total.....	473, 000

Assessed valuations.

Farms.....	\$186, 000
Towns.....	1, 680, 000
Public utilities.....	400, 000
Total.....	2, 266, 000
Value of crops produced in 1921.....	54, 320

Wholesale purchases of manufactures in 1921.

Dry goods, clothing, shoes, etc.....	\$1, 125, 000
Lumber.....	25, 000
Automobiles, trucks, etc.....	200, 000
Groceries.....	175, 000
Hardware.....	45, 000
Farm implements, etc.....	20, 000
Electrical supplies.....	5, 000
Coal, feed, flour, and bags.....	8, 000
Drugs and sundries.....	50, 000
Jewelry and miscellaneous instruments.....	10, 000
Cigars, etc.....	60, 000
Furniture.....	15, 000
Other merchandise.....	30, 000
Total.....	1, 768, 000

Other significant statistics, 1921.

Number of farms.....	130
Number of towns.....	1
Population.....	4, 100
Public schools.....	5
Churches.....	8
Newspapers.....	2
Banks.....	2
Capital stock.....	\$175, 000
Savings and Loan Association.....	1
Capital stock.....	\$1, 000, 000
Paid-in stock.....	\$50, 000
Number of depositors.....	60
Industries:	
Coal mines.....	7
Creameries.....	1
Flour mills.....	2
Acres irrigable (Williston irrigation district).....	7, 653
Acres irrigated, season of 1921.....	2, 081
Acre-feet of water pumped, season of 1921.....	2, 386
Acre-feet of water delivered to water users, season of 1921.....	1, 624
Tons of coal mined for consumption in project power house.....	12, 928
Capacity of power house, horsepower.....	2, 080
Electric power generated, year of 1921.....	2, 097, 000

Umatilla Project, Oregon.

Values created.

Value of farm lands and improvements on project, estimated by owners at close of 1921.....	\$3, 670, 000
Value of live stock.....	307, 000
Value of farm equipment.....	200, 000
Total.....	4, 177, 000

Assessed valuations.

Estimated at approximately.....	\$2, 500, 000
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Crops.

Value of crops produced in 1921.....	\$344, 000
Value of crops produced since 1912.....	2, 704, 000

Shipment of agricultural products in 1921.

	Carloads.
Alfalfa hay.....	1, 090
Alfalfa meal.....	11
Cattle.....	2
Sheep.....	35
Hogs.....	6
Horses.....	5
Melons.....	2
Apples.....	30
Rye.....	2
Wheat.....	7
Total.....	1, 190

Wholesale purchases of manufactures during 1921, estimated.

Automobiles and accessories.....	\$105,000
Hardware, crockery, farm machinery, etc.....	100,000
Dry goods, groceries, etc.....	205,000
Tobacco, cigars, candies, etc.....	34,000
Drugs, toilet articles, etc.....	16,000
Lumber, cement, etc.....	100,000
Total.....	560,000

Other significant statistics, 1921.

Number of farms.....	544
Number of towns.....	4
Population.....	2,842
Acres supplied with water.....	13,145
Acres in crop.....	11,610

Public schools.....	6
Churches.....	8
Newspapers.....	3
Banks.....	1
Industries:	
Creamery.....	1
Cheese factory.....	1
Alfalfa mill.....	1
Railroad roundhouse and car repair shops, monthly pay roll.....	\$18,000
Railroads: Union Pacific Railroad traverses entire project.	
Columbia River Highway traverses entire project.	
Storage: Cold Springs Reservoir; capacity, 50,000 acre-feet.	
Area, present project, 28,300 acres.	

RECLAMATION LAW NOTES.**The Bitter Creek Case.**

ON the Shoshone Federal irrigation project in Wyoming, the Reclamation Service sought to utilize a wash or channel, known as Bitter Creek, for the purpose of draining seeped lands, collecting waste and percolating water arising from the project, and diverting this water for beneficial use in connection with the project. Arthur W. Ide and others claimed rights under permits from the State to the use of seepage water from the project flowing in this channel. Suit was brought by the United States to enjoin these claimants from interfering with the Government construction work on this channel. The defendants, by way of counterclaim, asked that the United States be enjoined in its construction work and from performing any acts that would injure the defendants' lands and alleged water rights, and that they be given damages for trespasses already committed. The trial court granted defendants damages in the aggregate sum of \$3,150, dismissed the complaint, and enjoined the plaintiff and its representatives from interfering with defendants' alleged rights.

Appeal was taken by the United States to the circuit court of appeals, which reversed the decision of the lower court. (*United States v. Ide et al.*, 277 F. 373.) The following are the holdings of the appellate court in this case:

The fact that before irrigation of lands under a Government reclamation project commenced a wash or channel within the lands covered by the project carried water only as the run-off from rain or melting snow, and was generally dry during all the irrigating season, except the first 10 days, showed that the wash was not a natural stream, within Const. Wyo., art. 8, sec. 1, declaring the water of such streams to be the property of the State.

No definition of a natural stream or water course can be given that will apply to all cases, but the law requires, speaking generally, that a natural stream have a channel, boundary, permanent source of supply, and a permanent flow, and even if a water course in an arid region can be

claimed as a natural stream, though it would not be in another region, a dry run or wash, which was worthless as a stream from which adjacent lands can be irrigated, can not be classed as a natural stream.

That the State issued a permit for the appropriation of water from a water course does not make that water course a natural stream if in fact it was not.

Act August 30, 1890 (26 Stat. 391), reserving from patents to public lands thereafter issued a right of way for ditches and canals constructed by the authority of the United States, did not limit the reserved right to ditches constructed when the patent was issued, but authorized a reservation in the patent for ditches thereafter to be constructed.

A patentee of lands from the State, who knowingly took his patent subject to a reservation, pursuant to Comp. St. Wyo. 1920, sec. 4954, of a right of way for ditches constructed by the United States, can not contend as against the United States that the statute authorizing the reservation only applied to land while owned by the State.

The right of way reserved in a patent to lands for ditches constructed under the authority of the United States authorizes the construction of such ditches only in the exercise of due care, and the landowner can recover any damages resulting from negligent construction.

The United States may construct drainage works as a part of its irrigation system for a reclamation project.

Necessity for drainage in connection with a reclamation project and the method of conducting the work are in the sound discretion of the Secretary of the Interior, and his discretion can not be reviewed by the courts.

The United States can save and continue to use the drainage seepage and waste waters from its reclamation project, even after such waters had been allowed to escape, so long as they could be identified and had not been abandoned.

Even if waste water from a Government reclamation project had once been abandoned, the Government could thereafter reclaim such water and apply it to beneficial use, if no right of third parties had intervened.

The Antioch Case.

The town of Antioch, Calif., is a city of the sixth class located on the San Joaquin River about 4 miles above its entrance to San Francisco Bay. It diverts from said river

for municipal purposes a little less than 1 cubic foot of water per second. The Sacramento River enters said bay near the point of entrance of the San Joaquin. When the current of the waters of the two rivers is sufficiently strong, the influx of the incoming tides from the ocean is held back, so that in times of ordinary low water in the rivers the salt water does not reach and mingle with the fresh water of the San Joaquin River at a point above its entrance into the bay. As the volume of the waters of the two rivers decrease, the point in the San Joaquin River where the salt water begins to mingle with the fresh water ascends the stream. Large diversions of water from the Sacramento River by growers of rice and other appropriators have diminished the flow of the river in the extreme dry season of each year to such an extent that the tides of the bay impel salt water farther up the San Joaquin, and the mingling of the salt and fresh waters takes place above the point of the intake of the town's municipal water system, with the result that the water supply of the town is made salty and unfit for use. In order to prevent this condition, it apparently would be necessary that there be kept flowing in the Sacramento River in dry season not less than 3,500 cubic feet of water past the city of Sacramento.

Suit was brought by the town of Antioch in superior court against a large number of appropriators of water from the Sacramento River, and on January 7, 1921, that court made an order restraining the defendants "from diverting so much water from the Sacramento River and its tributaries to nonriparian lands that the amount of water flowing past the city of Sacramento, in the county of Sacramento, State of California, shall be less than 3,500 cubic feet per second."

Appeal was taken to the Supreme Court of the State of California, which reversed the decision of the lower court. (*Town of Antioch v. Williams Irr. Dist. et al.*, 205 P. 688). The following is taken from the syllabus of the opinion of the appellate court:

It is immaterial, as far as concerns the rights of a city seeking to enjoin diversion of water, that the action of the defendants impairs the availability of the stream for navigation, since a city has no power to supervise, control, regulate, or protect the uses of a stream for navigation, such being a matter for appropriate action by the proper State or Federal authorities.

One who acquires the right to divert water from a stream, by prescription, may enjoin a subsequent diversion at points above his place of diversion whenever he can show that such subsequent diversion above will so diminish the flow of the water that not enough will come down to supply the quantity to which he has acquired the prior right, or otherwise injure his water right.

An appropriator of water from a stream, for domestic and similar uses, has the right to enjoin a pollution of the stream above him, so that the water may flow down to his place of diversion in a condition as suitable for those uses as it was in at the time he acquired his right to take it.

Any person who appropriates water from a river at a point near to the meeting place of the river waters and sea waters must take notice of the conditions and of the policy of the law which favors, in every possible manner, the use of the waters of the streams for the purpose of irrigating the lands of the State to render them fertile and productive,

and discourages and forbids every kind of unnecessary waste thereof.

An appropriator or diverter of fresh water from a stream at a point near its outlet to the sea does not, by such appropriation, acquire the right to insist that subsequent appropriators above should leave enough water flowing in the stream to hold the salt water of the incoming tides below his point of diversion.

In an action to restrain diversion of waters by appropriators above, a contention that use of water for rice culture is a waste thereof, and should be prohibited, involves a legislative question which the court can not consider.

Condemnation of Land for Town Site in Aid of Federal Irrigation Project.

The reservoir proposed by the Reclamation Service to be constructed at American Falls, Idaho, as an extension of the Minidoka Federal irrigation project, would necessarily flood a portion of the present town site of American Falls, and without the power to acquire and improve a new town site it would be difficult, if not impossible, to acquire rights with respect to public streets, structures, and buildings in the area to be flooded essential to the carrying out of the project. For the purpose of providing for a new town site the United States brought suit in eminent domain to acquire title in fee to 120 acres of land, the property of De Witt G. Brown, under authority of a special provision in the appropriation act of March 4, 1921 (41 Stat. 1403). The defendant contested the suit upon the ground that the United States was without constitutional right to condemn the land in question for town-site purposes. In *United States v. Brown et al.* (279 F. 168), United States District Judge Dietrich held that the necessity of taking land by condemnation for public purposes is a legislative question, and when the taking is to be by the Government itself, an act authorizing it is presumed to be within the constitutional power of Congress, and that the said act of March 4, 1921, is valid and authorizes such condemnation.

Montana Irrigation Company not a Public Utility.

A company furnishing water for irrigation is not a "public utility" furnishing "water for business" within the meaning of Montana laws, 1913, chapter 52, and the Public Service Commission of the State of Montana has no power to regulate rates in view of Laws Ex. Sess. 1913, chapter 13, creating the irrigation commission. (*State v. Boyle*, 204, p. 378.)

Informal Application for Telephone Service.

The usual form of application for telephone service under rates fixed by law, signed by a person duly authorized on behalf of the United States for such purpose, does not meet the provisions of section 3744 of the Revised Statutes requiring a formal contract. The fact that the State, or the State through its instrumentalities, has undertaken to fix the rates to be charged by telephone companies is not sufficient to warrant contracting for the service in any

other way than that required by said section. A statute so specific in its requirements may not be set aside for the sake of convenience. There are other important and essential elements of a contract besides the mere price for service. (Dec. Compt. Gen., May 16, 1922.)

Appropriations for Reclamation Service.

[Extract from] an act making appropriations for the Department of the Interior for the fiscal year ending June 30, 1923, and for other purposes. [Act May 24, 1922, Pub. No. 224, 42 Stat. —.]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the following sums are appropriated, out of any money in the Treasury not otherwise appropriated, for the Department of the Interior for the fiscal year ending June 30, 1923, namely:

RECLAMATION SERVICE.

The following sums are appropriated out of the special fund in the Treasury of the United States created by the Act of June 17, 1902, and therein designated "the reclamation fund," to be available immediately:

For all expenditures authorized by the act of June 17, 1902 (Thirty-second Statutes, page 388), and acts amendatory thereof or supplementary thereto, known as the reclamation law, and all other acts under which expenditures from said fund are authorized, including salaries in the District of Columbia and elsewhere; examination of estimates for appropriations in the field; refunds for overcollections hereafter received on account of water-right charges, rentals, and deposits for other purposes; printing and binding; law books, books of reference, periodicals, engineering and statistical publications, not exceeding \$1,500; purchase, maintenance, and operation of horse-drawn or motor-propelled passenger-carrying vehicles; payment of damages caused to the owners of lands or private property of any kind by reason of the operations of the United States, its officers or employees, in the survey, construction, operation, or maintenance of irrigation works, and which may be compromised by agreement between the claimant and the Secretary of the Interior; and payment for official telephone service in the field hereafter incurred in case of official telephones installed in private houses when authorized under regulations established by the Secretary of the Interior:

Salt River project, Arizona: For examination of project and project accounts, \$5,000;

Yuma project, Arizona-California: For operation and maintenance, continuation of construction, and incidental operations, \$550,000;

Orland project, California: For operation and maintenance, continuation of construction, and incidental operations, \$125,000;

Grand Valley project, Colorado, including Orchard Mesa unit: For operation and maintenance, continuation of construction, and incidental operations, \$440,000;

Uncompahgre project, Colorado: For operation and maintenance, continuation of construction, and incidental operations, \$215,000;

Boise project, Idaho: For operation and maintenance, continuation of construction, and incidental operations: *Provided*, That the expenditure for drainage shall not exceed the amount paid by the water users pursuant to the provisions of the Boise public notice dated February 15, 1921, \$1,220,000;

King Hill project, Idaho: For operation and maintenance, continuation of construction, and incidental operations, \$450,000;

Minidoka project, Idaho: For operation and maintenance, continuation of construction, and incidental operations, with authority in connection with the construction

of American Falls Reservoir, to purchase or condemn and to improve suitable land for a new town site to replace the portion of the town of American Falls which will be flooded by the reservoir, and to provide for the removal of buildings to such new site and to plat and to provide for appraisal of lots in such new town site and to exchange and convey such lots in full or part payment for property to be flooded by the reservoir and to sell for not less than the appraised valuation any lots not used for such exchange, \$1,200,000;

Huntley project, Montana: For operation and maintenance, continuation of construction, and incidental operations, \$170,000;

Milk River project, Montana: For operation and maintenance, continuation of construction, and incidental operations, \$340,000, plus so much of \$350,000 additional as the Secretary of the Interior finds to be available in the reclamation fund on March 1, 1923, in excess of all other appropriations from that fund;

Sun River project, Montana: For operation and maintenance, continuation of construction, and incidental operations, \$345,000;

Lower Yellowstone project, Montana-North Dakota: For operation and maintenance, continuation of construction, and incidental operations, \$180,000;

North Platte project, Nebraska-Wyoming: For operation and maintenance, continuation of construction, and incidental operations, \$1,440,000;

Newlands project, Nevada: For operation and maintenance, continuation of construction, and incidental operations, \$915,000;

Carlsbad project, New Mexico: For operation and maintenance, continuation of construction, and incidental operations, \$65,000;

Rio Grande project, New Mexico-Texas: For operation and maintenance, continuation of construction, and incidental operations, \$1,000,000;

North Dakota pumping project, North Dakota: For operation and maintenance, continuation of construction, and incidental operations, \$115,000;

Baker project, Oregon: For investigation, commence; ment of construction, and incidental operations, \$400,000-

Umatilla project, Oregon: For operation and maintenance, continuation of construction, and incidental operations, \$500,000;

Klamath project, Oregon-California: For operation and maintenance, continuation of construction, and incidental operations, \$700,000;

Belle Fourche project, South Dakota: For operation and maintenance, continuation of construction, and incidental operations, \$350,000;

Strawberry Valley project, Utah: For operation and maintenance, continuation of construction, and incidental operations, \$85,000;

Okanogan project, Washington: For operation and maintenance, continuation of construction, and incidental operations, \$40,000;

Yakima project, Washington: For operation and maintenance, continuation of construction, and incidental operations, \$1,500,000;

Riverton project, Wyoming: For operation and maintenance, continuation of construction, and incidental operations, \$675,000, plus so much of \$250,000 additional as the Secretary of the Interior finds to be available in the reclamation fund on March 1, 1923, in excess of all other appropriations from that fund;

Shoshone project, Wyoming: For operation and maintenance, continuation of construction, and incidental operations, \$975,000;

Secondary projects: For cooperative and miscellaneous investigations, \$100,000;

For the continued investigation of the feasibility of irrigation, water storage, and related problems on the Colorado

River, and investigation of water sources of said river, \$100,000;

Under the provisions of this act no greater sum shall be expended, nor shall the United States be obligated to expend, during the fiscal year 1923, on any reclamation project appropriated for herein, an amount in excess of the sum herein appropriated therefor, nor shall the whole expenditures or obligations incurred for all of such projects for the fiscal year 1923 exceed the whole amount in the reclamation fund for that fiscal year;

Ten per centum of the foregoing amounts shall be available interchangeably for expenditures on the reclamation projects named; but not more than 10 per centum shall be added to the amount appropriated for any one of said projects, except that should existing works or the water supply for lands under cultivation be endangered by floods or other unusual conditions, an amount sufficient to make necessary emergency repairs shall become available for expenditure by further transfer of appropriation from any of said projects upon approval of the Secretary of the Interior;

Whenever, during the fiscal year ending June 30, 1923, the Director of the Reclamation Service shall find that the expenses of travel can be reduced thereby, he may, in lieu of actual traveling expenses, under such regulations as he may prescribe, authorize the payment of not to exceed 3 cents per mile for a motor cycle or 7 cents per mile for an automobile, used for necessary travel on official business;

Total, Reclamation Service, \$14,800,000.

For reimbursement to the reclamation fund the proportionate expense of operation and maintenance of the reservoirs for furnishing stored water to the lands in Yakima Indian Reservation, Washington, in accordance with the provisions of section 22 of the act of August 1, 1914 (Thirty-eighth Statutes at Large, page 604), there is appropriated, out of any money in the Treasury not otherwise appropriated, \$11,000.

* * * * *

Reclamation Provisions in Appropriation Act for Department of Agriculture.

[Extracts from] An act making appropriations for the Department of Agriculture for the fiscal year ending June 30, 1923. [Act May 11, 1922, Pub. No. 217, 42 Stat.—.]

* * * * *

General expenses, Bureau of Plant Industry.—* * *—

For investigations in connection with western irrigation agriculture the utilization of lands reclaimed under the reclamation act, and other areas in the arid and semiarid regions, \$94,420.

* * * * *

General expenses, Bureau of Soils.—* * *—For examination of soils to aid in the classification of agricultural lands, in cooperation with other bureaus of the department and other departments of the Government, \$15,000.

* * * * *

General expenses, Bureau of Public Roads.—* * *—For investigating and reporting upon the utilization of water in farm irrigation, including the best methods to apply in practice; the different kinds of power and appliances, and the development of equipment for farm irrigation; the flow of water in ditches, pipes, and other conduits; the duty, apportionment, and measurement of irrigation water; the customs, regulations, and laws affecting irrigation; for the purchase and installation of equipment for experimental purposes; for the giving of expert advice and assistance; for the preparation and illustration of reports and bulletins on irrigation; for the employment of assistants and labor in the city of Washington and

elsewhere; for rent outside of the District of Columbia; and for supplies and all necessary expenses, \$72,000;

For investigating and reporting upon farm drainage and upon the drainage of swamp and other wet lands which may be made available for agricultural purposes; for preparing plans for the removal of surplus water by drainage, and for giving expert assistance by advice or otherwise in the drainage of such lands; for conducting field experiments and investigations concerning the construction and maintenance of farm-drainage work; for investigating and developing equipment intended for the construction and maintenance of farm-drainage structures; for the purchase of materials and equipment; and for preparing and illustrating reports and bulletins on drainage; and for the employment of assistants and labor in the city of Washington and elsewhere; for rent outside of the District of Columbia, and for supplies and all necessary expenses, \$72,260;

Demonstrations on reclamation projects.—To enable the Secretary of Agriculture to encourage and aid in the agricultural development of the Government reclamation projects; to assist, through demonstrations, advice, and in other ways, settlers on the projects; and for the employment of persons and means necessary in the city of Washington and elsewhere, \$39,000.

* * * * *

Bills Relating to Federal Reclamation.

IN THE HOUSE.

H. R. 11449.—"A bill to provide for the protection and development of the lower Colorado River Basin," introduced April 25, 1922, by Representative Phil D. Swing, of California.

H. R. 11721.—"A bill to secure farm homes for disabled veterans of the World War who have received agricultural training through the United States Veterans' Bureau," introduced May 20, 1922, by Representative William B. Bankhead, of Alabama.

IN THE SENATE.

S. 3495.—"A bill to provide for reopening the accounts of Harry Caden and charging of certain expenses therein to a different appropriation from the one used in payment," introduced April 21, 1922, by Senator Selden P. Spencer, of Missouri.

S. 3511.—"A bill to provide for the protection and development of the lower Colorado River Basin," introduced April 25, 1922, by Senator Hiram W. Johnson, of California.

S. 3605.—"A bill authorizing the sale of surplus power developed under the Salt River reclamation project, Arizona," introduced May 13, 1922, by Senator Henry F. Ashurst, of Arizona.

S. 3657.—"A bill to authorize surveys and investigations for irrigation projects in the State of North Dakota, and for other purposes," introduced May 29, 1922, by Senator Porter J. McCumber, of North Dakota.

—Ottamar Hamel.

An average force of 38 men and 22 head of stock was employed every working day of March on the Orland project, placing 22,059 square yards of concrete lining on 2.4 miles of laterals. This constitutes the largest amount of lining ever placed during any one month by one mixer force in the history of the project.

ADMINISTRATIVE AND STATISTICAL PROGRESS REPORTS FOR MAY, 1922.

Monthly conditions of principal Reclamation Service reservoirs for May, 1922.

[Elevation above sea level.]

State and project.	Reservoir.	Available capacity in acre-feet.	Elevation.		Storage in acre-feet.			Out-flow in acre-feet.	Elevation of water surface.		
			Spill-way crest. ¹	Lowest gate sill. ²	Beginning of month.	End of month.	Maximum.		Beginning of month.	End of month.	Maximum.
Arizona, Salt River.....	Roosevelt ³	1,305,000	2128.1	1924.6	1,024,885	973,932	1,024,885	.....	2127.8	2124.25	2127.8
California, Orland.....	East Park.....	51,000	1199.68	1111.68	50,100	51,030	51,160	1,238	1199.2	1199.7	1199.77
Idaho:											
Boise.....	Arrowrock.....	280,000	3211	2964.5	228,600	273,800	281,300	611,400	3193.7	3210.1	3212.6
Minidoka.....	Deer Flat.....	177,000	2518	2488	177,000	141,300	177,000	55,100	2518	2514.2	2518
	Lake Wolcott.....	95,180	4245	4236	89,600	93,090	97,840	528,583	4244.52	4244.82	4245.22
	Jackson Lake.....	847,000	6769	6728	361,540	537,510	537,510	.....	6748.58	6756.33	6756.33
Montana:											
Milk River.....	Nelson.....	38,500	2216	2200	35,640	35,640	37,100	50	2215.21	2215.21	2215.62
St. Mary storage.....	Sherburne.....	66,000	4788	4720	.....	.....	.....	.....	.....	.....	.....
Sun River.....	Willow Creek.....	16,700	4130	4085	9,811	11,545	11,545	.....	4122.2	4124.5	4124.5
Nebraska-Wyoming, North Platte.	Pathfinder.....	1,070,000	5552	5670	802,870	868,910	868,910	260,511	5838.68	5842.32	5842.32
	Lake Alice.....	11,400	4182	4159	3,343	7,959	7,959	.....	4169	4177.2	4177.2
Nevada, Newlands.....	Lake Miniatore.....	60,760	4125	4074	50,992	60,983	60,983	.....	4120.3	4125.1	4125.1
	Lake Tahoe.....	120,000	6230	6224	.....	.....	.....	.....	6225.25	6226.15	6226.15
	Lahontan.....	290,000	4162	4060	232,760	273,600	273,600	19,809	4157.6	4163	4163
New Mexico:											
Carlsbad.....	McMillan.....	45,000	3267.7	3241.6	21,000	22,500	25,000	13,000	3262.8	3263.1	3263.8
Rio Grande.....	Elephant Butte.....	2,638,000	4407	4231.5	1,716,050	1,829,598	1,829,598	118,491	4380.7	4384.3	4384.3
Oregon, Umatilla.....	Cold Springs.....	50,000	621.5	560	49,100	49,550	49,550	12,291	620.91	621.22	621.22
Oregon-California, Klamath.	Clear Lake.....	462,000	4540	4514	432,000	433,000	438,000	.....	4038.9	4038.93	4039.12
South Dakota, Belle Fourche	Belle Fourche.....	203,000	2975	2920	158,380	154,100	163,180	19,565	2968.9	2968.3	2969.2
Utah, Strawberry Valley.....	Strawberry.....	250,000	7558	7517	232,000	250,000	250,000	9,000	7555.5	7558	7558
Washington:											
Okanogan.....	Conconully.....	14,400	2290	2232	3,200	3,767	3,767	3,170	2259.8	2261.9	2261.9
Yakima.....	Bumping Lake.....	34,000	3426	3389	3,355	22,675	22,675	.....	3394.2	3416.8	3416.8
	Lake Cle Elum.....	20,800	2134	2122	26,870	30,210	33,020	2,810	2135.2	2136.6	2137.8
	Lake Kachess.....	210,000	2258	2192	201,120	218,690	218,690	.....	2253.4	2257.4	2257.4
	Lake Keechelus.....	152,000	2515	2425	119,090	146,550	146,550	.....	2500.9	2512.5	2512.5
Wyoming, Shoshone.....	Shoshone.....	456,600	5360	5132.3	409,590	466,090	466,690	71,506	5352.7	5361.5	5361.5

¹ Or maximum storage.² Or zero storage.³ Zero water depth at elevation 1902.2.⁴ Amount of silt shown by silt survey deducted from original capacity.⁵ Proposed regulation.⁶ Estimated low-water limit under proposed plan of regulation.⁷ Elevation of reservoir raised 12 inches by stop logs in spillway.

SALT RIVER PROJECT, ARIZONA.

Water was run in all of the canals during May.

With a daily average of 175 man days and 27 stock days the following maintenance work was accomplished: 31.9 miles main canals cleaned; 164.6 miles laterals cleaned; 98 old structures repaired; 1,714 linear feet of rip-rap placed; 294 cubic yards of dirt fill placed; 1 cubic yard of concrete placed.

A demossing crew of 5 men and 12 head of stock, equipped with anchor chain, in three days demossed 8 miles of Western Canal, east of Center Street.

In addition to the above maintenance work a demossing crew of 5 men and 14 head of stock was put in the field May 16. This crew demossed 16 miles of Eastern Canal and 8 miles of East Branch Consolidated Canal up to the end of May. A similar crew with 5 men, 6 head of stock, and a Holt tractor demossed 9 miles of Grand Canal May 22 to 31.

The Ruth dredger with a daily average of 3 man days and 2 stock days bermed 32,080 linear feet of East Branch Consolidated Canal up to May 8, when the machine was moved to Phoenix for repairs. On May 18 the machine was moved to lateral 13 of the Grand Canal where it was assembled and additional parts were added, and bermed 2,000 cubic yards.

The P. & H. dragline (1½ yards) bermed 1,120 cubic yards of the Western Canal. The balance of the time (13 days) was spent in repairing, with average of 2 man days.

The following construction work was accomplished with a daily average of 91 man days and 28 stock days: 1.3 miles new irrigation ditch built; 6.6 miles new waste ditch built; 82 new structures built; 114½ cubic yards of concrete placed; 118 linear feet of 18-inch concrete pipe placed; 1,932 linear feet of 24-inch concrete pipe placed; 20 linear feet of 30-inch corrugated pipe placed; 10,965 cubic yards of earth excavated; 1½ miles pump laterals lowered.

Work continues on widening the Eastern Canal and with an average of 12 man days and 2 stock days, the Monighan 2-yard dragline and the Lidgerwood 1½-yard dragline, excavated 19,620 cubic yards.

The total power generated during the month was 9,348,290 kilowatt hours. The maximum load of the month occurred May 24, which was 15,320 kilowatts. The maximum average load occurred on May 25, which was 13,840 kilowatts. The maximum daily output for the month was 332,160 kilowatt-hours on May 25. The highest daily load factor was 95 per cent on May 15 and the lowest load factor was 80 per cent on May 9. The average load of the system for the month was 12,559 kilowatts. This is the largest amount of power ever generated by the system in any one month.

The Roosevelt power plant operated continuously during the month, generating 7,113,000 kilowatt-hours, with a maximum load of 11,800 kilowatts, an average load of 9,560 kilowatts, and a monthly load factor of 81 per cent. The average lake elevation during the month was 201.93 feet.

The Cross Cut power plant operated continuously during the month and generated 1,040,900 kilowatt-hours, with a maximum load of 2,200 kilowatts, an average load of 1,400 kilowatts, and a monthly load factor of 63.6 per cent.

The South Consolidated power plant operated 99.3 per cent of the time during the month, being shut down when water was not available on account of sluicing at Granite Reef Dam. The plant generated 466,200 kilowatt-hours, with a maximum load of 825 kilowatts, an average load of 631 kilowatts, and a monthly load factor of 76.5 per cent.

The Arizona Falls power plant operated 98.8 per cent of the time during the month and generated 346,700 kilowatt-hours, an average load of 471 kilowatts, with a maximum load of 600 kilowatts, and a monthly load factor of 78.5 per cent.

The Chandler power plant operated 78.7 per cent of the time during the month and generated 381,490 kilowatt-hours, with a maximum load of 550 kilowatts, an average load of 519 kilowatts, and a monthly load factor of 94.4 per cent.—*C. C. Cragin.*

YUMA PROJECT, ARIZONA-CALIFORNIA.

May weather was favorable for crops. Alfalfa sold readily at \$12.50 per ton f. o. b. Yuma, and there was an increase in the price of cotton; the outlook for these two crops is very favorable.

The type 14 Bucyrus completed 1,233 linear feet of the North Drain, excavating 4,300 cubic yards of earth and was laid up on May 6.

On the Valley Division, Ruth dredges 7, 8, and 9 cleaned 17 miles of laterals, excavating 24,500 cubic yards of silt. On the Reservation Division, Ruth No. 6 cleaned 4½ miles of lateral excavating 5,700 cubic yards of silt.

The maximum discharge of the Colorado River was 76,000 second-feet, minimum 32,300 second-feet, total for the month 3,437,000 acre-feet, the heaviest May run-

off since 1910. On May 31 the discharge was 75,100 second-feet with a gauge height of 24.2.—*Porter J. Preston.*

MESA DIVISION, YUMA PROJECT.

Construction work on the Yuma Mesa was confined to hauling lock joint pipe from the manufacturing plant to the place of installation, the building of concrete basin turnouts from pipe lines, farm turnouts from open ditches, road culverts and the laying of concrete pipe; 5,080 linear feet of pipe were laid and sealed.

On May 1 the B Lift Pumping Plant was put in operation to deliver water to unit holders, the small 16-inch pump was operated 340 hours, delivering 525 acre-feet of water to the top of the Mesa. On May 24 the first citrus fruit trees were planted. Mr. J. J. Wheat planting 8 acres in farm unit R in the southwest quarter of section 32.—*Porter J. Preston.*

ORLAND PROJECT, CALIFORNIA.

The remainder of the first crop of alfalfa was harvested early in May. The second crop was well matured but none cut at the close. A considerable acreage was being planted to milo. Orchards and vineyards, both of this and previous years' planting, were making a satisfactory growth. The Orland alfalfa-meal mill started the season's work of grinding alfalfa early in May.

Operation work consisted of the regular water deliveries to approximately 13,000 acres of land which were irrigated and to which 8,100 acre-feet of water were delivered. East Park Reservoir was filled to full capacity on the 13th. Cleaning of that section of the South Canal immediately below the head gates with the half-yard clam shell excavator was started.

Field work on the Millsite Reservoir survey was completed. Diamond drilling on the north side of the creek

Crop report, Yuma project, Arizona-California, 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Per unit of yield.	Values.	
			Total.	Average (per acre).		Total.	Per acre.
Alfalfa hay.....	20,550	Ton.....	54,266	2.64	\$7.93	\$430,378	20.95
Alfalfa seed.....	13,535	Pound.....	3,420,000	253	.14	477,970	35.31
Barley.....	2,145	Bushel.....	38,595	17.99	.56	21,700	10.12
Corn, sorghum.....	9,525	.....do.....	268,500	28.19	.58	155,360	16.31
Cotton, short staple.....	17,225	Pound.....	4,750,000	276	.16	760,000	44.12
Cotton, long staple.....	1,200	.....do.....	125,000	104	.30	37,500	31.25
Cotton seed.....	.....	Ton.....	4,625	.....	13.00	60,125	3.21
Fruit.....	102	Acre.....	.....	.....	.....	10,000	98.04
Garden.....	513	.....do.....	.....	.....	.....	42,890	83.60
Hay.....	355	Ton.....	420	1.18	5.45	2,287	6.45
Pasture.....	4,200	Acre.....	.....	.....	.....	34,000	8.10
Wheat.....	560	Bushel.....	9,678	17.28	1.12	10,850	19.37
Estimated additional revenue derived from pas- turing alfalfa lands.....	.....	.....	.....	.....	.....	55,000	.....
Less duplicated areas.....	17,510	.....	.....	.....	.....	.....	.....
Total cropped.....	52,400	Total and average.....	.....	.....	.....	2,098,060	40.04
Total irrigated.....	52,400	.....	.....	.....	.....	.....	.....
		Areas.	Acres.		Farms.	Per cent of project.	
		Total irrigable area farms reported.....	58,000		.....	93	
		Total irrigated area farms reported.....	52,400		1,211	84	
		Under water-right applications.....	45,000		1,151	73	
		Under rental contracts.....	7,400		160	12	
		Total cropped area farms reported.....	52,400		1,211	.....

at the dam site was finished and the equipment moved to the opposite bank.—*R. C. E. Weber.*

GRAND VALLEY PROJECT, COLORADO.

Prospects were excellent for a bumper fruit crop throughout the valley. Nearly all crops made a good growth and wheat, potatoes, sugar beets and alfalfa were all doing well. The old crop of alfalfa had nearly all been cleaned up and there was a good demand at prices ranging from \$8 to \$10 per ton in the stack. Grasshoppers were hatching out in alarming numbers on certain parts of the project and steps were being taken to start a campaign of extermination in cooperation with State and county officials.

The irrigation system was in continuous operation, supplying about 10,000 acre-feet of water to project lands and 6,000 acre-feet to the Palisade and Mesa County irrigation districts. Difficulty was experienced in maintaining uniform deliveries of water on account of the high winds which kept the laterals filled with tumble weeds. Crib-work and riprap to protect the canal below the diversion dam were completed, and riprap at the Jerry Creek siphon was repaired.

Drainage construction was continued with one Monighan dragline working two shifts per day, on the M system, and the P. & H. half-yard machine working one shift per day on the H system. Four thousand linear feet of drain were completed involving 19,000 cubic yards of excavation. Field work was continued on the investigation of seeped areas.

The contract with the Orchard Mesa irrigation district was confirmed in the district court and the record of the proceedings completed.—*S. O. Harper.*

UNCOMPAHGRE PROJECT, COLORADO.

Work was continued on the excavation and installation of structures on several of the small laterals that have been taken over for operation by the service. The uncollected

water rentals for the year 1922 at the end of the month amounted to approximately \$7,697, \$8,000 being collected during the month. The total cash collection to May 31 on account of water rentals for the season of 1922 amounted to \$36,333.87. The demand for irrigation water gradually increased until during the latter part of the month practically a full head was being carried in all the project canals and laterals. The cool weather which prevailed during practically the entire month and the cloudy weather which also existed from time to time retarded to a considerable extent the melting of snow on the Uncompahgre watershed, and as a result the Uncompahgre River was in low stage during the entire month. As a consequence, the flow through the Gunnison Tunnel was gradually increased in order to maintain the proper regulation in the river, and on May 17 the Gunnison Tunnel was diverting 700 second-feet into the valley. This flow was maintained for several days, after which the tunnel flow was gradually reduced until the flow diverted at the end of the month was only 300 second-feet.

The county of Montrose and the Reclamation Service cooperatively constructed a line of sheet piling about 320 feet long and located on the left bank of the Uncompahgre River several hundred feet above the sluiceway works of the Ironstone Canal. This piling work was faced with Page fencing and riprapped on both sides so as to prevent any overflow during the anticipated high water of the Uncompahgre River.

No difficulties were experienced in operating the project system during the entire month except for the sliding section on the Montrose and Delta Canal near M. P. 6.70. At this point settlement began during the week of May 14, and continued along the lower end of a 450-foot length, so that it became necessary on May 23 to put the dragline to work throwing the canal farther into the hillside and reinforcing the lower bank with the excavated material. At this time water was shut off for a period of about 2½ days after which a full head was turned in and this head was maintained until the end of the week. The middle

Crop report, Grand Valley project, Colorado, 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average (per acre).	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	4,555	Ton.....	12,035	2.64	\$7.74	\$93,112.00	\$20.44
Apples.....	257	Pound.....	2,085,850	8,120.00	.022	46,473.00	180.83
Beets.....	1,396	Ton.....	15,482	11.09	6.50	100,630.00	72.09
Beet tops.....	1,396	Acre.....				4,205.00	3.00
Corn.....	863	Bushel.....	19,256	22.31	.70	13,468.00	15.61
Corn fodder.....	1,072	Ton.....	1,644	1.53	1.88	3,100.00	2.89
Garden.....	63	Acre.....				6,086.00	96.60
Hay.....	80	Ton.....	78	.98	4.27	333.00	4.16
Oats.....	1,383	Bushel.....	33,215	24.02	.44	14,754.00	10.68
Potatoes.....	282	do.....	28,279	100.00	.74	21,004.00	74.50
Straw.....	2,954	Ton.....	4,016	1.36	1.03	4,118.00	1.39
Tomatoes.....	57	do.....	544	9.54	8.50	4,623.00	81.10
Wheat.....	1,715	Bushel.....	34,835	20.30	.78	27,308.00	15.92
Miscellaneous.....	516					17,516.00	33.94
Less duplicated areas.....	5,199						
Total cropped.....	11,390	Total and average.....				356,730.00	31.32
Nonbearing orchard.....	6						
Young alfalfa.....	815						
Ground fall-plowed.....	1,166						
Miscellaneous.....	479						
Less duplicated areas.....	1,556						
Grand total irrigated.....	12,300	Total irrigable area farms reported.....			19,806	402	39.6
		Total irrigated area farms reported under rental contracts.....			12,300	394	24.6
		Total cropped area farms reported.....			11,390	389	22.8

portion and upper end of this same section began settling to an alarming extent during the latter part of the week, and on Sunday night it became necessary to shut down the main canal head gates. The collapse in this section was principally in a vertical direction, and it is estimated that the middle portion of the original canal bank settled in such direction to an extent of from 20 to 25 feet. The break was repaired by excavating a new channel farther into the hillside by the use of the dragline, and by the construction of a timber flume 23 feet 6 inches wide in the clear, 5 feet high, and 528 feet long. Active work in placing the flume was commenced on Wednesday morning, May 31, and the flume was completed at 7 p. m. on June 3. The main canal head gates were opened Saturday at 11 p. m., and since that time no difficulty has been experienced in maintaining a full head through the canal.—*L. J. Foster.*

BOISE PROJECT, IDAHO.

The early part of May was rather cool, with a hard frost on the night of the 9th, which did considerable damage to early blooming fruits. The latter part of the month was splendid growing weather.

Corn and late potatoes were planted. Early potatoes were well up out of the ground and were cultivated and irrigated. Alfalfa and grain crops were irrigated and made good growth. The prospects at the end of the month for a good crop were very favorable.

The run-off from Boise River was 753,000 acre-feet or about 47 per cent above normal. The filling of Arrowrock Reservoir was completed and a large amount of water washed down the river.

The demand for water for irrigation was heavy; the canals were brought up to practically their maximum capacity. A bad break occurred on the Penitentiary Lateral, which washed out about 200 feet of canal on a steep hill side. The break caused no damage to adjacent property.

Work was continued on the excavation of the Greenleaf and Drew Drains in the Wilder district. On the Greenleaf considerable indurated material was encountered, which required the use of powder.—*J. B. Bond.*

KING HILL PROJECT, IDAHO.

Frosts on May 9 and 10 did some damage to garden stuff, but staple crops received no material damage.

A force of 10 men with teams placed 1,936 yards of back fill on lateral 5-E (Hammett siphon); put in one rubble paving drop, two 24-inch by 18-foot metal culverts, 80 linear feet of 24-inch lock-joint pipe culvert, two timber turnouts and two weirs on lateral 7-E, and three 24-inch by 18-foot metal culverts and three rubble paving drops on lateral 9-A. The P. and H. 206 drag line in 30 shifts excavated 1,452 yards of class 2 material on lateral 9-A and placed 1,125 yards of back fill on King Hill siphon.

A maintenance crew of six men was engaged throughout the month constructing and installing turnouts and weirs and repairing old wooden structures. Continuous service was furnished to 9,000 acres during the entire month, with but one interruption of three hours, when a break in the main canal necessitated turning the water out. The district has paid the United States in full for 1921 operation and maintenance charges and an advance toll charge of 50 cents per acre on upward of 9,000 acres for the season of 1922.

Planting of crops was completed, and though the weather during the first part of the month was not conducive to good growth crops in general are looking splendid at the end of the month. Alfalfa has made good growth and will be ready for the first cutting in about 10 days. Early potatoes are looking fine and will be on the market in about two weeks. Fruit prospects are still good, the frost damage to the commercial varieties being negligible.

Pasture grasses and range feed have improved materially and stock are now all on the range. Shearing has been completed. Range stock are in splendid condition.—*Walter Ward.*

MINIDOKA PROJECT, IDAHO.

The weather during May was generally favorable for crops, and farm work was pushed. On the 25th occurred

Crop report, Minidoka project, South Side pumping division, Idaho, 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	15,868	Ton.....	41,588	2.6	\$5.00	\$207,940	\$13.10
Alfalfa seed.....	274	Bushel.....	703	2.6	9.00	6,327	23.09
Barley.....	571	do.....	16,546	29.0	.40	6,628	11.61
Beets.....	4,464	Ton.....	46,615	10.4	6.00	279,700	62.65
Clover.....	341	do.....	699	2.1	4.00	2,796	8.20
Clover seed.....	893	Bushel.....	3,277	3.6	9.00	29,493	33.03
Corn.....	48	do.....	1,185	24.7	.70	830	17.29
Corn fodder.....	27	Ton.....	69	2.6	3.00	207	7.67
Garden.....	342					9,560	27.95
Oats.....	1,310	Bushel.....	41,557	31.7	.25	10,389	7.93
Pasture.....	1,461					16,895	11.56
Potatoes.....	6,693	Bushel.....	1,366,271	204.00	.70	956,389	142.89
Rye.....	14	do.....	160	11.4	.80	128	9.14
Wheat.....	11,014	do.....	301,070	27.0	.80	240,858	21.87
Total cropped.....	43,320	Total and average.....				1,768,140	40.81
Orchard.....	137						
Young alfalfa.....	1,475						
Young clover.....	130						
Miscellaneous.....	2,321						
		Areas.	Acres.	Number of farms.		Per cent of project.	
Less duplicated areas.....		Total irrigable area farms reported.....		48,777		915	
		Total irrigated area farms reported.....		46,580		915	
Total irrigated.....		Total cropped area farms reported.....		43,320		915	

one of the most severe windstorms the project has experienced in years. About 1,000 acres of beets were destroyed and other crops damaged.

About 300 applications for relief under the act of March 31, 1922, had been filed at the end of the month for the South Side pumping division. On the gravity division the number of applications was about 50. Preliminary crop estimates indicate that the acreage planted this year will practically equal that of 1921.

The South Side pumping stations were started on the 6th, and their discharge increased until by the end of May it had nearly reached capacity. The demand for water at the close of the month was very heavy.

At American Falls the survey of right of way on Indian lands was practically completed and the party transferred to the Mountain Home survey. On this work the triangulation system was extended about 3 miles and about 800 acres of topography taken.—*Barry Dibble.*

HUNTLEY PROJECT, MONTANA.

The major portion of the operation and maintenance work was completed, cleaning of the main canal below Pompeys Pillar was finished on May 19, and the drag line moved to the high-line canal, where about one-half mile of ditch will require cleaning. The Ruth machine arrived on the 9th and was immediately unloaded and began work on lateral FO-1 and continued working throughout the month.

Agricultural work is now well advanced and only a small acreage remains to be seeded. About 3,400 acres of beets are contracted for on the project and thinning was well under way.—*A. R. McGinness.*

MILK RIVER PROJECT, MONTANA.

May weather was favorable for growing crops but rather unfavorable for planting and construction work and hard on young lambs.

Contractor for Nelson Reservoir enlargement made fair progress, and five small earthwork contractors commenced or continued work making fair progress.

Enlargement of Nelson Reservoir Canal, station 1020 to 1160, and permanent improvements at Saco operation and maintenance headgates were completed. Work on grading around gate tenders' quarters at Dodson Dam, on operation and maintenance roads, placing a few small wooden structures was in progress, and construction by dragline of VW1-3 waste-water ditch on Glasgow division was begun.

The small demand for water was filled by operating the canals intermittently. The Ruth machine operated one shift per day through the month cleaning about 4 miles of laterals and waste-water ditches near Malta. Operating mechanism for crest gates at Vandalia Dam was inspected, adjusted, and lubricated. Repairs were made to trestles and concrete headwork at Vandalia Point flume on the Glasgow division.—*Geo. E. Stratton.*

ST. MARY STORAGE DIVISION.

The first part of May was cold; several storms hindered construction and operation and maintenance work.

The canal was operated from the 20th to the end of the month, a total of 1,679 acre-feet being diverted from the St. Mary River and 963 acre-feet being delivered to the North Fork of the Milk River.

Maintenance work was confined to excavating a section of St. Mary River crossing pressure pipe which is to be

Crop report, Minidoka project Gravity Division, Idaho, 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa hay.....	26,902	Ton	85,940	3.2	\$5.00	\$429,700	\$15.97
Alfalfa seed.....	182	Bushel.....	765	4.2	9.00	6,885	37.80
Apples.....	359	do.....	24,480	68.2	1.00	24,480	68.20
Barley.....	795	do.....	33,104	41.7	.40	13,242	16.66
Beans.....	22	do.....	167	7.7	3.00	501	23.00
Beets, sugar.....	2,075	Ton	23,618	11.3	6.00	141,710	68.28
Beets, mangle.....	37	do.....	819	22.1	5.00	4,095	110.67
Clover hay.....	1,928	do.....	4,029	2.1	4.00	16,116	8.35
Clover seed.....	1,897	Bushel.....	7,711	4.1	9.00	69,400	36.58
Corn, Indian.....	934	do.....	33,330	35.6	.70	23,331	24.98
Corn fodder.....	169	Ton	1,593	9.4	3.00	4,779	28.30
Small fruit.....	20	Pound.....	77,500	3,875.2	.03	2,325	116.25
Garden.....	608	do.....	79.56	79.56	.....	48,400	79.56
Common hay.....	102	Ton	202	1.9	3.00	606	5.94
Oats.....	3,004	Bushel.....	129,953	43.2	.25	32,488	10.81
Pasture.....	3,759	do.....	.....	.....	.....	50,800	13.51
Potatoes.....	3,533	Bushel.....	663,546	187.8	.70	464,482	131.48
Miscellaneous.....	270	do.....	.....	.....	.....	30,640	114.00
Rye.....	166	Bushel.....	5,425	32.7	.80	4,340	26.14
Wheat.....	11,733	do.....	341,022	29.1	.80	272,820	23.25
Less duplicated areas.....	1,095	.....	.....	.....	.....	.....	.....
Total cropped.....	57,400	Total and average.....	.....	.....	.....	1,641,140	28.59
Nonbearing orchard.....	50	.....	.....	.....	.....	.....	.....
Young alfalfa.....	2,300	.....	.....	.....	.....	.....	.....
Miscellaneous.....	1,850	.....	.....	.....	.....	.....	.....
Less duplicated areas.....	950	.....	.....	.....	.....	.....	.....
Total irrigated.....	60,650	.....	.....	.....	.....	.....	.....
		Areas.....	Acres.....	Number farms.....	Per cent of project.....		
		Area occupied by townsites.....	661	.....	.....
		Total irrigable area farms reported.....	71,451	1,539	.....	
		Total irrigated area farms reported.....	60,650	.....	84.1		
		Under water-right applications.....	72,112	.....	.....
		Total cropped area farms reported.....	57,400	.....	79.6		

replaced, placing of new compression bars in Spider Coulee flume, placing a crib in Swift Current diversion to prevent cutting of the stream channel, and minor repairs to canal banks and structures.

There was at the end of the month considerable snow in the mountains, and it is probable that there will be considerable high water during June or comparatively late high water in July.—*R. M. Snell.*

SUN RIVER PROJECT, MONTANA.

Repairs to Willow Creek discharge structure were completed. On the Fort Shaw division 7 concrete checks, 7 turnouts, and 1 drop were installed, chiefly in replacing old wooden structures, and several miles of laterals were cleaned. On the north side cleaning and repairing of concrete canal lining, cleaning and raising banks of laterals, and burning of weeds were in progress. Telephone lines Nos. 1, 2, and 3 were repaired and about 2,300 feet of new line built.

Earthwork contractors on part 2 of Greenfields division excavated about 13,700 cubic yards of material.

Seven cars of hay, 2 of potatoes, and 8 of wheat were shipped from the project.

The commissioners of the Fort Shaw irrigation district met with the project manager on May 20 to consider applications for relief under the act of March 31. The general attitude was that relief should be granted only in deserving cases and where it was impossible to raise the necessary money to pay the delinquent charges.—*Geo. O. Sanford.*

LOWER YELLOWSTONE PROJECT, MONTANA-NORTH DAKOTA.

May was favorable for plant growth, although the rainy weather delayed farming operations, and some crops will be late.

Contractor J. E. Hilton, under contract 864, has completed 32 schedules, and in spite of the slow progress made during May on account of rainy weather, very little work will be remaining under this contract by the end of June. Contractors Beauchaine & Klug, under contract 878, made poor progress, due to the unfavorable weather and the frozen condition of the material in excavating for the check at canal mile 6.8. At the end of the month the only main canal structures remaining unfinished under this contract were the Ferry Coulee flume and the lateral H turnout. Work on the Thomas Point pumping plant was pushed all possible. Several days were lost on account of the rainy weather, but in spite of these conditions it is believed water can be run in the main canal by the pumping plant not later than June 10. Fortunately the unusual amount of rain in May has made it unnecessary to use water for irrigation.

Nearly all steel structures on the main canal have been cleaned and painted. The burning of weeds was also completed and everything was in readiness to turn water into the main canal as soon as the construction work on the pumping plant had reached a point where water could be run without endangering the work. During the month 6 concrete checks were installed, 6 decayed wooden drops were replaced with reinforced-concrete chutes, and 10 main canal pipe turnouts were installed to replace wooden structures and to bring under irrigation high lands heretofore excluded.

Mr. F. M. Schaefer has obtained options on more than 10,000 acres in the vicinity of Fairview, or that part of the project tributary to the Great Northern Railway. While the list price in some of these options may be somewhat excessive, it is expected that before the season is over a considerable number of new settlers will be received on the project through the efforts of Mr. Schaefer.

Crop report, Huntley project, Montana, 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average per acre.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	5,538	Ton.....	9,564	1.73	\$7.97	\$76,234	\$13.78
Alfalfa seed.....	31	Bushel.....	136	4.39	4.46	607	19.59
Barley.....	247	do.....	5,906	23.91	.46	2,707	10.96
Beets, sugar.....	2,839	Ton.....	27,005	9.51	6.78	183,359	64.24
Clover hay.....	32	do.....	34	1.06	8.70	296	9.23
Clover seed.....	100	Bushel.....	168	1.68	4.43	744	7.44
Corn.....	375	do.....	7,307	19.51	.68	4,991	13.31
Garden.....	139					11,939	85.18
Oats.....	1,630	Bushel.....	35,191	21.58	.398	13,873	8.51
Pasture.....	1,479					7,981	5.40
Pasture, winter.....	15,473					23,480	1.52
Potatoes.....	185	Bushel.....	18,500	100.00	.814	15,065	81.43
Wheat.....	5,469	do.....	93,684	17.12	1.01	94,520	17.29
Miscellaneous.....	379					4,974	13.15
Alfalfa.....	22	No crop value.					
Barley.....	24						
Beets, sugar.....	43						
Corn.....	14						
Oats.....	72						
Wheat.....	30						
Less duplicated areas.....	15,476						
Total cropped.....	18,440	Total and average.....				440,770	23.90
Miscellaneous.....	360						
Total irrigated.....	18,800						
		Areas.		Acres.	Number farms.	Per cent of project.	
		Total irrigable area farms reported.....		28,161	614	100	
		Total irrigated area farms reported under water-right applications.....		18,440			
		Total cropped area farms reported.....		18,440	578	.67	

The alfalfa on the project was never in better condition. With proper care three good cuttings should be harvested, while some of the crops were seeded late, the project as a whole never looked better.—*L. H. Mitchell.*

NEWLANDS PROJECT, NEVADA.

Favorable weather for project work prevailed during May. Frost on May 10 and 11 with the temperature falling to 23° F. caused some damage to fruits and vegetables. Frost on May 26 also caused some damage to cantaloupes.

The Lahontan Dam spillways were in operation for the first time on May 22, and on May 31 the two spillways were discharging 1,870 second-feet.

The Truckee River was at flood stage during the month but the surface of Lake Tahoe recorded only a slow rise. Work of uncovering the Lahontan power plant steel penstock for inspection and repainting was commenced.

Bids were opened on May 16 for seven schedules of earthwork involving about 11,345 cubic yards in short extensions to the lateral system. One contract involving 1,244 cubic yards in the Brum lateral was let at a unit price of 4½ cents per cubic yard. Other contracts were awarded at 9½, 9½, and 10 cents per cubic yard.

Government construction forces placed 11 new minor timber structures in the lateral system and excavated a portion of the Gault lateral wasteway.

Drainage construction work was continued with seven drag-line excavators in operation on the Kent Lake, Piute, Upper Soda Lake, Harmon, Carson Lake, L, Hazen, and Fernley Drains.

A wasteway about 1 mile in length was also excavated from the S₂ lateral into the Kent Lake Drain and necessary structures placed in same. A Monighan drag line was used on this work following completion of the Kent Lake Drain.—*John F. Richardson.*

CARLSBAD PROJECT, NEW MEXICO.

A total of 5,550 acre-feet was delivered to the farms during May.

Replanting of cotton, caused by heavy rains the latter part of April, was in progress, and at the close of the month had been practically completed; good stands were reported over the entire cotton area with the exception of a few small seeped areas near the town of Loving. Cutting of the first crop of alfalfa hay commenced about the 20th. During the last week of May a few fields were damaged by showers. The price of alfalfa hay opened at about \$18 per ton and gradually declined, until at the end of the month the best hay was selling for about \$11 per ton.

Flocks of sheep which had been held for lambing on the project during the spring were generally moved to the ranges during the latter part of the month. Practically all of the fat lambs shipped to the Kansas City markets were sold at prices averaging about \$14 per hundred. Eight car loads of fat yearlings were shipped to the El Paso and Fort Worth markets. The El Paso shipment of two cars brought 8½ cents per pound; the Fort Worth shipment had not been sold at the close of the month.—*L. E. Foster.*

RIO GRANDE PROJECT, NEW MEXICO-TEXAS.

In the Mesilla Valley eight machines continued drain and lateral construction, all working on a one-shift basis except one class 9½ Bucyrus excavator on drains. Two Bucyrus class 9½ and one Monighan 2-T excavators moved 56,700 cubic yards from 4,395 feet of drain, considerable repair work reducing the output. One Bucyrus 9½ and two P. and H. 206 machines placed 36,265 cubic yards in 3.1 miles of lateral and two Ruth machines removed 16,500 cubic yards from 6.9 miles of lateral; also one small lateral

involving 4,712 cubic yards of excavation was built by contract.

In the El Paso Valley only three machines were in operation, a Bucyrus 9½ and a Bucyrus 30-B continuing on drain construction and a Ruth ditching machine on lateral reconstruction. The second Bucyrus 9½ underwent major repairs and was ready to resume drain construction pending right-of-way negotiations. Water for irrigation was delivered throughout the month, comprising 23,084 acre-feet. There was an increase in storage of 103,548 acre-feet. The surface of the reservoir is now 10.4 feet below the spillway gate collars; and if the inflow during the month of June equals that of June, 1921, there will be an overflow through the gates.

Practically all of the first crop of alfalfa had been harvested, and hay was selling for \$15 to \$18 per ton.

Elephant Butte Reservoir is increasing in popularity as a pleasure resort. Visitors are arriving in increasing numbers, and practically all of the cottages have been leased for the summer. Bass fishing is the chief attraction.

There still remain on the Rio Grande project six 3-ton class B Army trucks for transfer to other projects requiring them. These trucks, which cost the Army \$4,200 each, are being transferred at \$300 and can be put in first-class condition in the local Reclamation Service shop for approximately \$100.—*L. M. Lawson.*

NORTH DAKOTA PUMPING PROJECT.

The project looks better than for many years. Alfalfa came through the winter without winter killing, and there is a splendid stand. If water is applied early in June, three crops are assured. Cool weather and rain somewhat above normal in the latter part of the month helped the conditions very much.

The pumping barge was launched, the land stations had been started, maintenance work in the power house was in satisfactory condition, the mine developed and working places ready for the irrigation force; and as the month closed every feature of the project was in readiness for pumping operations, which were scheduled to begin June 1.

The power plant was operated as usual for the commercial power contract with a load only 1 per cent less than that of the same month last year.

About 1,000 tons of coal were mined and 100 tons were added to storage.—*William S. Arthur.*

UMATILLA PROJECT, OREGON.

On May 9 a killing frost did heavy damage to the fruit crop. Water supply conditions were better than usual for this time of the year, and no shortage was looked for.

Because of the backward season, farmers in many cases harvested their first crop before it bloomed. Strawberries and early garden truck were marketed. Some spraying of apples was done.

The feed canal was operated to replace storage water turned out for irrigation. The Cold Springs Reservoir was full and will be kept so as long as river water is available for the purpose. Irrigation was general over the project, and all canals were in operation.

Construction, east division.—A number of extensions were made to lands not previously supplied with adequate or economical deliveries, involving the excavation of about 2,700 cubic yards of material, the laying of 3,317 linear feet of 20-inch and 1,050 linear feet of 16-inch concrete pipe, and the placing of 8 minor structures. The pipe-manufacturing plant was operated continuously, turning out 2,460 linear feet of 12-inch, 3,140 linear feet of 16-inch, and 2,420 linear feet of 20-inch concrete pipe.—*H. M. Schilling.*

KLAMATH PROJECT, OREGON-CALIFORNIA.

Practically all spring work on the farms was completed by the end of May. Water was turned into the project canal system on April 23; water deliveries were begun on May 10. The demand for water was light until toward the end of the month.

The work of grouting the flume joints was completed, and also the turnouts and other minor structures built in connection with the flume. On the C-G Canal a concrete lining was placed for a distance of about 500 feet above the inlet to the Lost River pipe lines.

The work of enlarging the C Canal and rebuilding the toe drain has been largely completed; the material excavated during the month amounted to 4,940 cubic yards. In the Tule Lake division good progress was made in constructing the J Canal and parallel waste ditch; during the month 46,700 cubic yards of material were excavated. On the lateral system 19,160 cubic yards of material were excavated. All of the above work was done by three drag-line excavators.—*Herbert D. Newell.*

Prevailing crop prices at close of May, 1922.

Project.	Alfalfa hay, per ton.		Barley, per bushel.	Oats, per bushel.	Wheat, per bushel.	Potatoes, per bushel.
	In stack.	Baled at shipping point.				
Salt River.....	\$7-\$9	\$10-\$12	\$0.68	\$0.50	\$1.38	\$3.00
Yuma.....	8.00	12.50	.....	.....	.....	1.80
Orland.....	8.00	12.00	.77	.....	1.26	.....
Grand Valley.....	8.00	12.00	.....	.45	1.00	.75
Uncompahgre.....	5-10	.....	.63	.45	.93	.30
Boise.....	6.00	10.00	.65	.65	.95	.75
King Hill.....	8.00	.....	.....	.51	.....	.....
Mimidoka.....	7-9	.....	.60	.47	.87	.36
Huntley.....	.....	.....	.....	.....	.....	.....
Milk River.....	12.00	14.00	.75	.50	1.21	.70
Sun River.....	10.00	17.00	.90	.85	1.18	1.10
Lower Yellowstone	.....	.....	.70	.50	1.23	.80
North Platte.....	.....	.....	.....	.....	.....	.....
Newlands.....	8.00	11.00	.72	.....	1.50	.75
Carlsbad.....	.....	9-12	.....	.....	.....	.....
Rio Grande.....	.....	15-18	.....	.....	.....	.....
North Dakota	.....	.....	.....	.....	.....	.....
pumping.....	15-18	.....	.38	.35	1.38	.90
Umatilla.....	10.00	14.00	.....	.....	.....	.....
Klamath.....	10.00	.....	.53	.40	1.02	.....
Belle Fourche.....	10.00	14.00	.53	.45	1.25	1.00
Strawberry Valley.	.....	12.00	.75	.57	1.10	4.80
Okanogan.....	.....	.....	.....	.....	.....	.....
Yakima.....	.....	9-13	.....	.....	.....	.60
Shoshone.....	11.00	14.00	.....	.60	1.00	.70
Indian projects:	.....	.....	.....	.....	.....	.....
Blackfoot.....	15.00	.....	.96	.62	1.24	.....
Flathead.....	.....	18.50	.....	.....	1.18	.....
Fort Peck.....	.....	.....	.....	.....	.....	1.00

BELLE FOURCHE PROJECT, SOUTH DAKOTA.

Farmers were able to finish planting their small grain fields although somewhat delayed by too much moisture. Planted crops came up to a good stand and alfalfa made rapid growth. Some fields were almost ready to cut at the end of May. The acreage seeded to small grains was somewhat under normal on account of numerous rains.

On the 12th an unusually heavy windstorm dislodged about 70 of the 5 by 6½ feet concrete paving blocks on the Belle Fourche Dam. Temporary repair was quickly effected by making timber curtains of 4 by 8—22 timbers threaded on a ½-inch cable and slipped down over the opening on railroad rails for support. After these curtains were shoved into place no more damage occurred from wave action.

Owing to the unusual amount of precipitation a very small amount of water was delivered for irrigation.—*B. E. Hayden.*

STRAWBERRY VALLEY PROJECT, UTAH.

The price of hay remained about the same as the previous month; cereals advanced with few shipments made. The price of live stock, especially lambs, advanced slightly during the month with considerable activity in the market.

Strawberry Reservoir was filled to overflowing on the 16th and at the end of the month 600 second-feet were wasting over the spillway at Strawberry Dam.

The first sheep and cattle reached the Strawberry grazing land on the 10th and at the end of the month the majority of live stock were on the range.

The irrigation season began about the 10th when all systems were drawing water. A total of 16,330 acre-feet of water was delivered during the month to the several divisions under the project. On the last day of the month the High Line Canal was drawing 200 second-feet and the Spanish Fork River discharging 920.

The power plant was in continuous operation and power furnished under contract to the several project towns, which consumed a total of 82,071 kilowatt-hours.

The reinforced concrete retaining wall on the north side of the Joint Canal between the tailrace and the spillway was completed on the 18th.

Utah Lake rose to 3½ feet above compromise level, the highest since 1868. As a result thousands of acres of land adjacent to Utah Lake were inundated and rendered useless.—*W. L. Whittemore.*

OKANOGAN PROJECT, WASHINGTON.

The cool weather in May held back the run-off from Salmon Creek watershed and only 5,637 acre-feet were stored during the month; of this amount 3,170 acre-feet were released for irrigation.

The Robinson Flat pumping plant was started on May 18 for the season's run. The mechanical force was engaged on repairs to power plant No. 2, the temporary erection of the Duck Lake pumping plant, the completion of the transmission lines to Duck Lake and the Government wells, the erection of the substations at these two points, and in installing the motors at the two Government wells. Supplemental construction on the concrete lining of ditches was continued and the placing of concrete in these laterals was started on May 1. At the end of the month 228 yards of concrete were placed and 9,580 linear feet of ditch lined.—*Calvin Casteel.*

YAKIMA PROJECT, WASHINGTON.

Sunnyside division.—Diversion through the Sunnyside Main Canal reached a maximum of 1,260 second-feet (the capacity of the canal) with an average diversion of 1,219 second-feet. Several leaks developed in the canal banks, the most serious one occurring in a high fill near Mile 48, which caused interruption of water service below Sulphur Creek wasteway for two days. Water delivery to the several irrigation districts was continuous, except to the Prosser irrigation district, the pumps being shut down two days on account of insufficient water supply while repairing leak at Mile 48 of main canal.

Pieton division.—Diversion reached a maximum of 310 second-feet on the 12th, the average for the month being 299 second-feet. Demand for water was very light during the first 10 days of the month, due to the late season and the presence of more than the usual amount of moisture in the soil. Minor interruptions on account of failure of small reinforced concrete pipe lines were experienced on

Part 1. Maintenance work was confined almost entirely to the sub lateral system. About 1,600 linear feet of 6, 8 and 10 inch sewer tile and wood-stave pipe were installed to replace concrete pipe lines and wooden flumes, and about 7,500 linear feet of sewer tile and concrete pipe 6 to 12 inches diameter were laid to replace open ditches, the material for this work being furnished by the water users benefited.—*J. L. Lytel.*

TETON DAM.

The placing of embankment progressed favorably. A good puddle core was being obtained; 110,000 cubic yards of embankment were placed during the month.

Core wall excavation for the season had been nearly completed. The core wall in the river section had been brought to elevation 2,746. The permanent concrete plant had been practically completed.

A contract was let for falling, bucking, and hauling to the mill 500,000 feet b. m. of saw logs from the reservoir right of way at a cost of \$7 per thousand b. m. The sawmill resumed operation the last of the month.—*F. T. Crowe.*

RIVERTON PROJECT, WYOMING.

Dragline 121474 was employed on the second division Wyoming Canal, May 1 to 5, moving 4,731 cubic yards, about two-thirds of which was sandstone. During the remainder of the month it was idle on account of a broken crankshaft.

On the Wind River Diversion Dam dragline 121322 was employed screening gravel and backfilling. A total of 880 cubic yards of concrete was placed in the sluice piers, logway, weir, and fore apron. Excavation of cut-off trenches was continued by hand. Work was suspended on the weir on May 19 on account of the usual spring rise of Wind River.

On the dike at the diversion dam dragline 121323 loaded 13,034 cubic yards on wagons for the embankment.

One survey party was employed on topographic surveys.

The weather was favorable for construction. The roads were in fair condition throughout the month and in good shape at the end of the month. The flow of Wind River was about normal and the snow storage on the watershed was in excess of normal.—*H. D. Comstock.*

SHOSHONE PROJECT, WYOMING.

A crew of about 60 men continued work on the power plant construction. The emergency valve house building at the base of the dam was completed and the power plant building was completed except for the east half of the roof extension, the rock backfill on the roof, and the finishing of the turbine and gallery floors. The 33,000-volt transmission line was completed on the 13th and the substation at Deaver erected.

On the Frannie division the work on the electrification of Bucyrus class 9½ dragline No. 131328 was continued and work was started on the construction of the temporary transmission line from Deaver to Frannie, for use on drainage construction. Bucyrus dragline No. 121475 renewed excavation on Drain 105 on the 25th. Considerable class 3 drilling and blasting was done on this drain before the machine renewed excavation.

On the Garland division the Bucyrus dragline No. 121324 began work on Drain 27 structures and recutting on the second, and the P. & H. dragline No. 121161 began recutting Drain 28 on the 6th.

The Bucyrus class 14 dragline No. 121472 moved from the Shoshone River crossing to the head of the Willwood Canal during the fore part of the month and was then dismantled preparatory to changing to electrical operation.

This work of electrification was temporarily discontinued on the 22d, when high water in the Shoshone River made it necessary to remove the temporary bridge across the river.

The canal system of the Garland and Frannie divisions has been on an operation basis the entire month. Requirement for water was light during the first 20 days of the month, but in the last 10 days the demand was very strong, and at the close of the month 845 second-feet were being diverted from the river. Maintenance work consisted mainly of repairs to minor structures.

The Shoshone River has been at flood stage since the 18th. On the 24th water began to discharge over the spillway at Shoshone Reservoir.—*J. S. Longwell.*

INDIAN PROJECTS, MONTANA.

BLACKFEET PROJECT.

The weather during the first part of May was rather cold and backward. The latter part of the month was much warmer and due to the moisture in the ground, which was greater than has been the case for several years, conditions were exceptionally favorable for plant growth.

Construction work consisted of completion of the work of remodeling Four Horns Reservoir outlet structure, placing a few minor timber structures on Two Medicine, Badger-Fisher, and Birch Creek divisions, and starting construction on the Four Horns Reservoir Outlet Canal.

Four Horns Reservoir Supply Canal was operated from the 12th to the end of the month for filling the reservoir, and water was turned into the Two Medicine Canal on the 20th. No water was delivered to farms.

Maintenance work consisted of repairs to laterals and lateral structures on the three divisions mentioned above, and repairs to Two Medicine, Four Horns Supply, and Fisher Canals.

The indications are that the run-off later in the season will be greater than the average year.

Owing to the ample moisture in the ground crop conditions at the end of the month were satisfactory, although because of the backward season some of the seeding was done late. About the same area on the project will be put in as last year.—*R. M. Snell.*

FLATHEAD PROJECT.

Weather conditions were favorable for crops. A large flood run-off is expected on account of the deep snow remaining in the mountains.

Good progress was made on contract No. 858 for concrete lining of Dry Creek Canal; 6,290 linear feet of canal were lined and the contract was 87.2 per cent completed.

Farmers on the Mission Valley and Camas divisions excavated 15,000 cubic yards of class 1 material on lateral extensions, crediting their wages to delinquent water rental and construction charge accounts.

Crews at operation and maintenance camps practically completed the spring maintenance work and placed 3 wooden drops, 10 turnouts, 9 checks, 8 weirs, and 2 cross drains. Repair of camp buildings and hauling of equipment was in progress at the Hubbard Reservoir construction camp. The Bucyrus 35-B steam shovel was moved to St. Ignatius and partially overhauled preparatory to beginning work on the Tabor Feed Canal.

Delivery of water for irrigation of alfalfa began during the latter part of the month; 1,450 acre-feet were delivered.

Prospective land buyers from Minnesota visited the project during the month and reported themselves as being favorably impressed with the opportunities of the Flathead country.—*C. J. Moody.*

FORT PECK PROJECT.

Flood damage to Big Porcupine Canal and Roplar Diversion Dam was repaired and delivery of water begun

on Little Porcupine and Poplar divisions. Back filling of minor structures on Big Muddy division continued as weather conditions permitted.

Owing to the late spring and heavy precipitation farmers were behind with their seeding, but such crops as were seeded were making excellent growth. Streams were higher than usual and the water supply should be ample.—*S. A. Kerr.*

GENERAL OFFICES.

Washington office.—Director Davis, Assistant Director Bien, and Chief Counsel Hamele were in the office the entire month.

Statistician Blanchard and Photographer Dame left about the middle of the month on a trip through the West, covering a number of the projects, to secure material to supplement motion-picture films for the exhibit of the Department of the Interior at the Brazilian Exposition in Rio de Janeiro next September. Pictures will also be taken for the Geological Survey, Bureau of Education,

Bureau of Indian Affairs, and National Park Service. The work will be done without cost to the Reclamation Service.

In connection with the plans for the consolidation of the Denver and Washington offices at the latter point, the Secretary gave instructions that the proposal be held in abeyance for future decision in the light of subsequent developments and all pertinent facts.

Action was taken by the Secretary on the following matters, among others, submitted to him:

Recommending that appraisers be appointed to appraise lots in Veteran town site, North Platte project, and that the sale take place on June 27; approved May 26.

Recommending that a letter be sent to the Payette-Boise Water Users' Association calling on the association to make payment to the United States of delinquent charges for drainage purposes, amounting to about \$77,000; signed May 23.

Recommending approval of a plan to appoint inspectors on the North Platte project to investigate conditions of

Comparison between operation and maintenance estimates and results, January 1 to May 31, 1922.

Project.	Gross cost.				Net accruals and revenues.				Area for which water is available (acres).
	Estimate for 1922.		Actual cost to May 31.	Amount *over or under	Estimate for 1922.		Actual returns to May 31.	Amount more or *less than estimate.	
	Total for year.	To May 31.			Total for year.	To May 31.			
UNDER PUBLIC NOTICE.									
Belle Fourche.....	\$70,000	\$18,500	\$23,000	*\$1,500	\$101,153	\$12,500	¹ \$12,500	.....	82,500
Boise.....	290,000	110,000	93,000	17,000	290,000	75,000	¹ 75,000	.....	167,300
Carlsbad.....	52,000	20,400	25,700	*5,300	56,625	23,200	17,600	*\$5,600	25,000
Huntley.....	45,000	18,500	15,000	3,500	46,500	2,500	.....	*2,500	30,000
King Hill.....	35,500	9,000	9,000	.....	² 35,500	9,000	9,000	.....	16,900
Klamath.....	55,000	28,000	16,000	12,000	² 55,000	28,000	16,000	*12,000	51,000
Lower Yellowstone.....	36,000	13,000	6,300	6,700	² 36,000	13,000	6,300	*6,700	40,200
Minidoka (South Side).....	94,000	35,000	25,000	10,000	95,300	5,500	5,000	*500	49,000
Newlands.....	105,000	48,000	63,000	*15,000	121,000	39,000	¹ 39,000	.....	72,200
North Dakota Pumping.....	35,000	(³)	(³)	(³)	*30,820	(³)	(³)	(³)	7,650
North Platte (Interstate).....	165,000	50,000	50,000	.....	166,700	14,000	10,500	*3,500	⁴ 130,000
Okanogan.....	37,000	15,000	12,000	3,000	² 53,720	31,720	28,720	*3,000	8,460
Orland.....	35,000	15,000	10,900	4,100	35,230	11,600	11,600	.....	20,500
Rio Grande.....	231,000	127,000	125,000	2,000	*233,945	129,945	127,945	*2,000	116,000
Shoshone.....	70,000	24,000	23,000	1,000	75,750	8,500	7,000	*1,500	71,100
Strawberry Valley.....	⁵ 25,000	(³)	(³)	(³)	⁶ 52,500	(³)	(³)	(³)	59,100
Sun River (Fort Shaw).....	14,000	9,000	5,500	3,500	15,600	1,600	¹ 1,600	.....	13,900
Umatilla.....	37,280	15,000	14,500	500	*37,280	15,000	14,500	*500	24,400
Yakima:									
Sunnyside.....	130,000	(³)	(³)	(³)	148,776	(³)	(³)	(³)	103,000
Tieton.....	84,000	(³)	(³)	(³)	89,800	(³)	(³)	(³)	32,000
Yuma.....	260,000	100,000	100,000	.....	262,000	112,000	93,000	*19,000	63,200
Total.....	1,905,780	655,400	616,900	38,500	2,039,199	532,065	475,265	*56,800	183,410
UNDER WATER RENTAL.									
Grand Valley.....	50,000	22,000	18,000	4,000	50,800	10,000	13,000	3,000	38,400
Milk River (including St. Mary) ..	71,500	27,200	16,800	10,400	22,000	4,500	1,500	*3,000	⁷ 74,000
North Platte (Fort Laramie).....	70,000	27,000	23,000	4,000	53,000	4,700	6,000	1,300	43,400
Sun River (Greenfields and Big Coulee).....	25,000	8,300	5,500	2,800	30,000	3,000	.....	*3,000	28,500
Uncompahgre.....	135,000	60,000	72,000	*12,000	142,500	40,000	39,000	*1,000	100,000
Total.....	351,500	144,500	135,300	9,200	298,300	62,200	59,500	*2,700	284,300
INDIAN.									
Blackfeet.....	30,000	9,000	4,700	4,300	19,700	500	.....	*500	21,500
Flathead.....	69,740	(³)	(³)	(³)	(³)	(³)	(³)	(³)	105,000
Fort Peck.....	14,600	(³)	(³)	(³)	(³)	(³)	(³)	(³)	22,400
Total.....	114,340	.....	.....	.....	.....	.....	.....	.....	148,900

¹ Assumed same as estimate. Actual returns not given by project.

² Returns regulated by district contract.

³ Operation and maintenance chart not received from project.

⁴ Includes 17,000 acres for which water is carried in Main Canal.

⁵ Not including tunnel repairs.

⁶ Included installment of \$25,000 for tunnel repairs.

⁷ Stored water is furnished through the St. Mary Canal for 21,600 acres additional.

farmers applying for extension under the relief act; disapproved June 1.

The Boulder Canyon report has been issued as Senate Document No. 142. Representatives from Imperial Valley and vicinity consulted with Congressman Swing, Director Davis, and others regarding proposed legislation for the construction of a reservoir at Boulder Canyon and an All-American High Line Canal from the river into Imperial Valley, as a result of which Congressman Swing has introduced a bill in the House, H. R. 11449, and Senator Johnson in the Senate, S. 3511.

Under the provisions of Senate Joint Resolution No. 132, giving general authority for the issuance of Government publications authorized by the head of each executive department, subject to the approval of the Director of the Budget, the Director of the Budget has been requested by the Secretary to approve the publication of the RECLAMATION RECORD in the form in which it was issued prior to the first of the year.

Representatives of nine water-improvement districts of the Lower Rio Grande Valley, representing 300,000 acres, have been in Washington requesting that a contract be entered into with the Reclamation Service providing for additional investigations along the Lower Rio Grande.

During the month 95 purchase orders were placed and 8 advertisements issued. Purchases amounted to \$6,114.30. The storehouse filled 200 requisitions and made 20 sales from stock, the total value amounting to \$2,673.17.

Publications issued during the month comprised 42 copies of the annual report and 506 miscellaneous publications. The 31 mimeograph jobs amounted to a total run of 23,505 sheets.

The settlement and information section answered 478 inquiries concerning the service and opportunities on the projects. At the end of the month the total number of inquiries from ex-service men concerning opportunities on the land amounted to 193,311.

The photographic laboratory turned out work during the month to the value of \$392.75, distributed as follows: Washington office, \$115.95; field, \$245.20; sales, \$31.60.

Denver office.—The chief engineer was in Washington, D. C., from May 1 until May 20, when he and the designing engineer left for Porto Rico to report on plans for an irrigation project for the Porto Rican Government. Assistant Chief Engineer R. F. Walter left Denver on May 9 for a visit to the Carlsbad project and the secondary investigations being carried on in New Mexico by Engineer Bonstedt. He returned on May 20 and left for the Uncompahgre project on May 27. Assistant Chief Engineer Charles P. Williams left on May 14 for the Belle Fourche project to consult with the project manager relative to repairs to the dam which was considerably damaged by a severe wind and rain storm on May 12. Engineer James Munn returned on May 10 from an extended field trip. During May he visited the Yakima and Umatilla projects.

The principal work accomplished in the designing section during the month consisted of the following: Continued work on final designs for Black Rock Canyon Diversion Dam, Boise project; prepared preliminary designs and estimates for Boulder Canyon Detention Reservoir, 8,000,000 acre-feet capacity, 52,000 second-feet flood discharge; also an estimate of cost to enlarge above detention reservoir to provide 23,500,000 acre-feet storage; made studies for 24,000,000 acre-foot overflow dam at Boulder Canyon with power house located in the tail of the dam; prepared and published advertisement and specifications for concrete structures, Tule Lake division, and designs for gates and hoists for Langell Diversion Dam, Klamath project; checked for approval specifications and drawings for repair and rebuilding of Slick Bridge and completed preliminary design and estimate for Cold

Springs Reservoir, King Hill project; checked for approval and publication specifications for structures, Nelson Reservoir and Vandalia Canal, Milk River project; traced original topographic sheets of the Rio Grande Valley for the Middle Rio Grande project; prepared and partially checked detail designs for the Horse Creek lateral diversion dam and headworks, North Platte project; revised designs of Wind River Diversion Dam, Riverton project; resumed work on the preparation of detail designs for Willwood Diversion Dam, and partially prepared detail designs for permanent highway bridge over Shoshone River for Willwood Division, Shoshone project; and began studies for connecting upper set of outlet gates to discharge into spillway channel, Tieton Dam, Yakima-Storage Project.

The principal work accomplished in the electrical division consisted of the following: Studies were made for the outlet works for the Hubbard Dam, Flathead project; tests were made of the balanced needle valves in the North Tunnel outlet, Pathfinder Dam, North Platte project, and the hydraulically operated emergency gates and slide gate were also tested and found to operate satisfactorily; specifications and advertisements were issued for transmission line materials and motors for the electrification of three farmers' wells, Okanogan project; estimates were made for new construction to deliver power to the Standard Oil Co. at Greybull, Wyo., and for the town of Basin, Wyo., Shoshone project; an estimate was made of the cost of installing a new penstock between the Lahontan power plant and the Lahontan Dam, Newlands project; designs were completed and specifications issued for a flap valve to be installed at the upper end of the discharge pie at the B lift pumping plant, Yuma auxiliary project; and specifications were prepared for the electrical and hydraulic equipment for the Pilot Butte power plant, Riverton project.

In the cost and property section arrangements were made for the transfer of approximately \$11,000 worth of equipment and sales were made amounting to nearly \$1,500.

Among the more important matters considered in the legal section were: Relief under act of March 31, 1922, in connection with delinquent water charges on the Sun River, Grand Valley, and Shoshone projects; delivery of water to lands involved in the so-called Bitter Creek suits, Shoshone project; acquisition of lands for Thief Valley Reservoir site, Baker project; application for transfer of water right for lands in Okanogan irrigation district, Okanogan project. The more important forms of contracts considered or prepared were: Proposed contract with Commissioners of Park County, Wyo., covering construction of Willwood Bridge, Shoshone project; contract with Platte Valley Power Co. for sale of power to the town of Yoder, Wyo., North Platte project; contract with town of Powell for furnishing electrical energy, Shoshone project; and contract with town of Frannie, Wyo., for domestic and municipal water supply, Shoshone project.

In the purchasing division 312 advertisements were issued and 445 vouchers prepared, involving a net expenditure of \$88,631.05.—Chas. P. Williams.

The recent planting of 310,000 Kadota fig cuttings on an orchard in the Orland project constitutes one of the largest individual plantings of Kadota fig cuttings ever made in California.

The water delivered to the land on the Carlsbad project, New Mexico, in 1920, amounted to 53,644 acre-feet, or 2.42 acre-feet per acre of land irrigated.

ADMINISTRATIVE ORGANIZATION.

DEPARTMENT OF THE INTERIOR.

Hon. ALBERT B. FALL, Secretary of the Interior.
 EDWARD C. FINNEY, First Assistant Secretary.
 FRANCIS M. GOODWIN, Assistant Secretary.
 EDWIN S. BOOTH, Solicitor for the Interior Department.
 CHARLES V. SAFFORD, Administrative Assistant to the Secretary.
 HARRY G. CLUNN, Private Secretary to the Secretary.
 JOHN HARVEY, Chief Clerk and Superintendent of Buildings.

U. S. RECLAMATION SERVICE.

WASHINGTON, D. C.

Arthur Powell Davis, director; Morris Bien, assistant director; Otta-mar Hamelc, chief counsel; J. B. Beadle, director's assistant; C. J. Blanchard, statistician; Hugh A. Brown, editor and office assistant; C. A. Bissell, engineer; C. A. Lyman, acting chief accountant; Miss H. A. Fellows and Raymond Dupue, fiscal agents; C. H. Fitch, chief clerk; Emmet Carr, purchasing agent; G. W. Numbers, appointment clerk; H. N. Blekel, Yakima, Wash.; W. A. Meyer, Denver, Colo.; and W. F. Kubach, Great Falls, Mont., examiners of accounts.

DENVER, COLO.

F. E. Weymouth, chief engineer, Tramway Building, Denver, Colo.; R. F. Walter and C. P. Williams, assistant chief engineers; Miss L. H. Meisel, secretary to the chief engineer; J. M. Gaylord, electrical engineer; J. L. Savage, designing engineer; James Munn, engineer; J. M. Luney, chief clerk; A. McD. Brooks, purchasing agent; Harry Caden, fiscal agent.

FIELD LEGAL OFFICES.

Boise, Idaho.—B. E. Stoutemyer, district counsel. Projects: Boise, Minidoka, King Hill, and Jackson Lake Enlargement; R. M. Patrick, district counsel, located at American Falls, Idaho.

Denver, Colo.—Law section office of chief engineer: Armand Offutt, district counsel.

El Paso, Tex.—P. W. Dent, district counsel. Projects: Rio Grande, Carlsbad, and Hondo.

Las Cruces, N. Mex.—Mark B. Thompson, attorney in charge of litigation on Rio Grande and Carlsbad projects.

Helena, Mont.—E. E. Roldis, district counsel, Helena, Mont. Projects: Blackfeet, Flathead, Fort Peck, Huntley, Milk River, St. Mary Storage, Sun River, North Dakota Pumping, Lower Yellowstone, and Shoshone.

Mitchell, Nebr.—J. N. Beardslee, district counsel. Projects: North Platte, Belle Fourche, and Riverton.

Montrose, Colo.—J. R. Alexander, district counsel. Projects: Grand Valley, Uncompahgre, and Strawberry Valley.

Portland, Oreg.—H. L. Holgate and D. G. Tyree, district counsel. Projects: Yakima, Okanogan, Umatilla, and Klamath.

San Francisco, Calif.—Henry A. Cox and Brooks Fullerton, district counsel, 349 Pacific Building. Projects: Salt River, Yuma, Orland, and Newlands.

PROJECT ORGANIZATION.

Belle Fourche Project.—B. E. Hayden, project manager, Newell, S. Dak.; R. C. Walber, chief clerk; August Lewin, fiscal agent.

Boise Project.—J. B. Bond, project manager, Boise, Idaho; E. R. Mills, chief clerk; C. F. Weinkauff, fiscal agent.

Carlsbad Project.—L. E. Foster, project manager, Carlsbad, N. Mex.; V. L. Minter, chief clerk and fiscal agent.

Grand Valley Project.—S. O. Harper, project manager, Grand Junction, Colo.; C. H. Young, chief clerk; A. H. Hall, fiscal agent.

Huntley Project.—A. R. McGinness, project manager, Ballantine, Mont.; G. H. Bolt, chief clerk; Miss M. C. Simek, fiscal agent.

King Hill Project.—Walter Ward, project manager, King Hill, Idaho; T. W. Hause, chief clerk; L. D. Eakin, fiscal agent.

Klamath Project.—H. D. Newell, project manager, Klamath Falls, Oreg.; N. G. Wheeler, chief clerk; G. R. Barnhart, fiscal agent.

Lower Yellowstone Project.—L. H. Mitchell, project manager, Savage, Mont.; C. A. Denman, chief clerk.

Milk River Project.—G. E. Stratton, project manager, Malta, Mont.; H. A. Parker, engineer; E. E. Chabot, chief clerk; G. S. Moore, fiscal agent.

Minidoka Project.—Barry Dibble, project manager, Burley, Idaho; Dana Templin, engineer; F. C. Diehl, chief clerk; Miss A. J. Larson, fiscal agent; F. A. Banks, engineer, American Falls, Idaho.

Newlands Project.—J. F. Richardson, project manager, Fallon, Nev.; A. W. Walker, engineer; G. B. Snow, chief clerk and fiscal agent.

North Dakota Pumping Project.—W. S. Arthur, project manager and chief clerk, Williston, N. Dak.; H. C. Melaas, fiscal agent.

North Platte Project.—Andrew Weiss, project manager, Mitchell, Nebr.; H. W. Bashore, engineer, Fort Laramie Division; Paul Roth, irrigation manager; J. R. Ummel, chief clerk; Miss A. L. Perrine, fiscal agent.

Okanogan Project.—Calvin Casteel, project manager, Okanogan, Wash.; W. D. Funk, chief clerk and fiscal agent.

Orland Project.—R. C. E. Weber, project manager, Orland, Calif.; E. T. Eriksen, engineer; C. H. Lillingston, chief clerk and fiscal agent.

Rio Grande Project.—L. M. Lawson, project manager, El Paso, Tex.; T. W. Parry, irrigation manager; C. A. Peavey, chief clerk; L. S. Kennicott, fiscal agent.

Riverton Project.—H. D. Comstock, project manager, Riverton, Wyo.; R. M. Conner, engineer; G. H. Murphy, chief clerk; Miss Grace M. McCarthy, fiscal agent.

St. Mary Storage Division.—R. M. Snell, project manager, Brown-ing, Mont.; F. H. Shiner, chief clerk, and fiscal agent.

Salt River Project.—Being operated by the Salt River Valley Water Users' Association; C. C. Cragin, general superintendent and chief engineer, Phoenix, Ariz.

Shoshone Project.—J. S. Longwell, project manager, Powell, Wyo.; J. R. Iakisch, engineer; C. M. Jump, superintendent of irrigation; W. F. Sha, chief clerk; Miss L. C. Drinkwater, fiscal agent.

Strawberry Valley Project.—W. L. Whittemore, project manager, Provo, Utah; J. E. Overlade, chief clerk and fiscal agent.

Sun River Project.—G. O. Sanford, project manager, Great Falls, Mont.; H. W. Johnson, chief clerk; Miss M. G. Valentine, fiscal agent; G. A. Benjamin, irrigation manager, Fairfield, Mont.

Umatilla Project.—H. M. Schilling, project manager, Hermiston, Oreg.; G. C. Patterson, chief clerk and fiscal agent.

Uncompahgre Project.—L. J. Foster, project manager, Montrose, Colo.; A. H. Peach, chief clerk and fiscal agent.

Yakima Project.—J. L. Lytel, project manager, Yakima, Wash.; R. K. Cunningham, chief clerk; J. C. Gawler, fiscal agent; M. D. Scroggs, superintendent of irrigation, Sunnyside, Wash.; J. S. Moore, superintendent of irrigation, Route 6, Yakima, Wash.; F. T. Crowe, engineer in charge construction Tieton Dam, Rimrock, Wash.; C. F. Gleason, engineer; V. G. Evans, chief clerk; C. B. Funk, fiscal agent.

Yuma Project.—P. J. Preston, project manager, Yuma, Ariz.; R. M. Priest, superintendent of construction; S. A. McWilliams, engineer, Yuma Mesa Division; E. R. Scheppelmann, chief clerk; E. M. Philebaum, fiscal agent.

INDIAN PROJECTS.

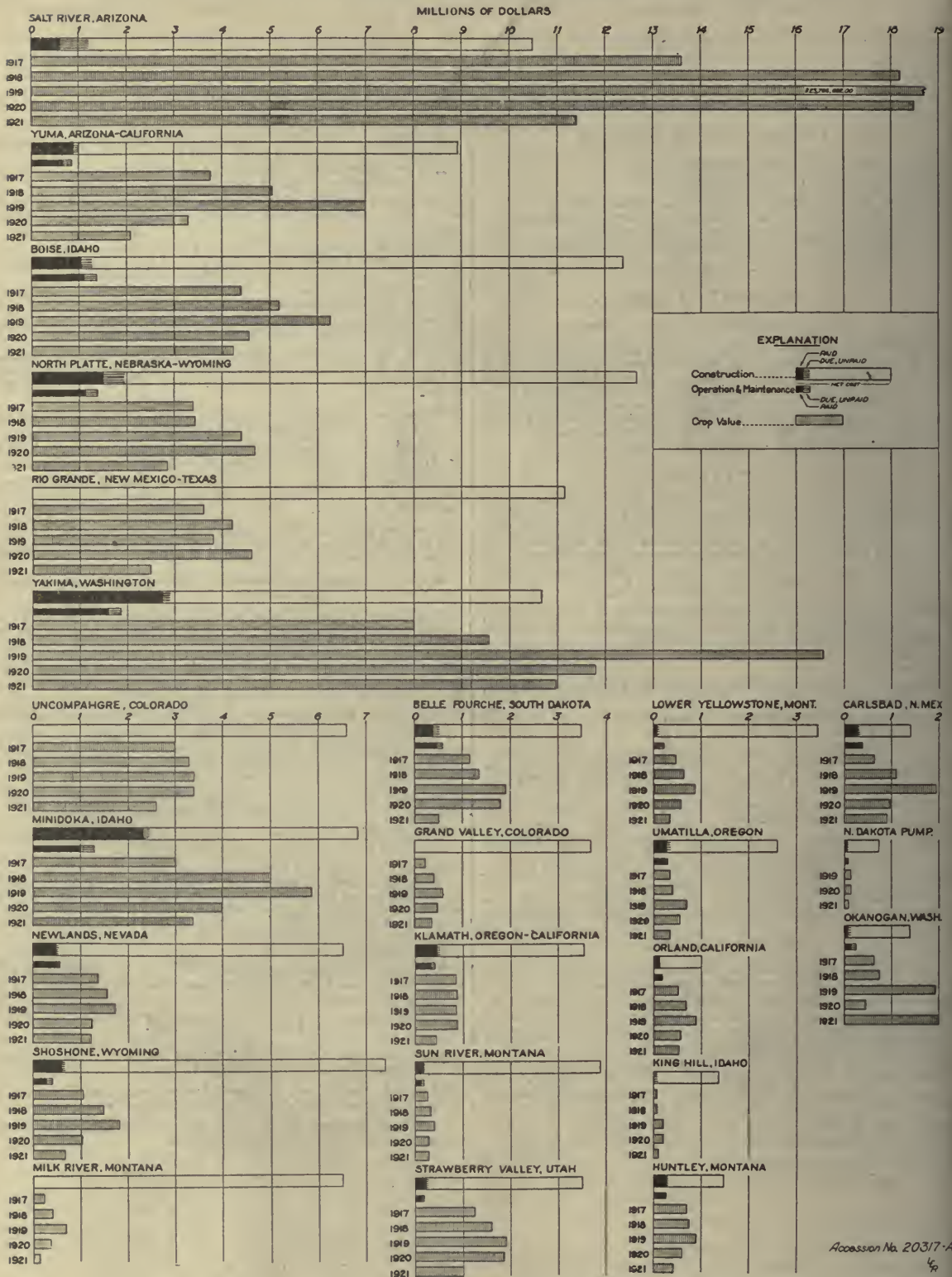
Blackfeet Project.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk and fiscal agent.

Flathead Project.—C. J. Moody, project manager, St. Ignatius, Mont.; J. M. Swan, chief clerk; J. P. Siebeneicher, fiscal agent.

Fort Peck Project.—S. A. Kerr, project manager, Poplar, Mont.; Henry Berryhill, chief clerk and fiscal agent.

COST AND CROPS

UNITED STATES RECLAMATION SERVICE IRRIGATION PROJECTS



Accession No. 20317-A

FIG. 10. Construction cost, operation and maintenance, amount repaid by water users, and amount due and unpaid, compared with gross value of crops, 1917 to 1921.

The Reclamation Record

An ADMINISTRATIVE and STATISTICAL REPORT

Issued Monthly by the RECLAMATION SERVICE, DEPARTMENT OF THE INTERIOR, Washington, D. C.

CERTIFICATE: By direction of the Secretary of the Interior the matter contained herein is published as administrative (or statistical) information and is required for the proper transaction of the public business.

VOLUME 13, No. 7

JULY, 1922

TWENTY YEARS OF RECLAMATION—Continued.

IN the June RECLAMATION RECORD data were given regarding the receipts and expenditures of the reclamation fund, the area cropped, the annual crop production, acreages, values, and related facts regarding the projects as a whole. In conclusion, figures were given regarding the acreage and crop returns of the individual projects. The following statements are a continuation of these facts pertaining to each of the principal projects completed to a point where success has been assured.

Irrigable, Irrigated, and Cropped Area (Fig. 1).

Not all of the land for which water is available has as yet been brought into production. A portion averaging possibly 15 per cent will never be used in the

actual raising of foodstuffs, as the land must be permanently occupied by houses, barns, and rights of way for farm roads, ditches, and other purposes. The area which is actually producing crops, however, is increasing, and especial efforts are being made to bring into production a larger proportion each year.

Figure 1 illustrates the conditions prevailing on 22 projects, which are arranged in general in geographical order and all on the same relative scale, except the diagram in the lower right-hand corner which combines the conditions on all of the projects on a scale ten times that of the other small diagrams.

Table 1 gives by projects the area irrigable, irrigated, and cropped in 1921. This shows that in the aggregate there are upward of 500,000 acres for which

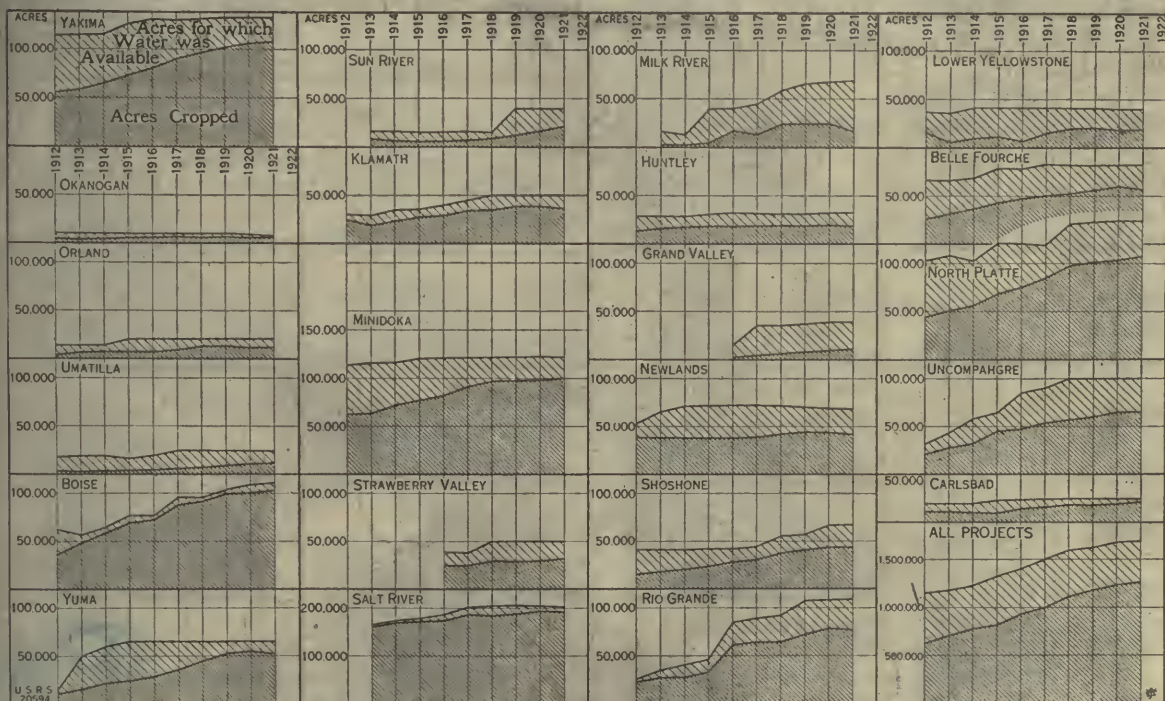


FIG. 1.—Acreage irrigable and cropped on specified projects, by years, 1912-1921.

water has been provided, but which were not cropped in 1921. This, however, does not indicate a failure to utilize this entire acreage. About 69,600 acres were irrigated, but did not produce a crop, as the land was largely in young alfalfa and fruit trees not yet in bearing. In addition, there should be subtracted from the irrigable area of 1,674,100 acres about 15 per cent given over, as stated above, to farm buildings, roads, ditches, and other purposes which will never be put into crops. These deductions leave less than 200,000 acres for which water is available which apparently should be planted to crops, but which at the present time are not being put to such productive use. Further reductions should probably be made of land temporarily withheld from settlement for a seasoning of canals or other action preliminary to inviting in farmers; public land awaiting entry; and State, railroad, and Indian lands more or less in process of subdivision and settlement. The greater part of this unirrigated and uncropped land is in the projects in the northern and eastern parts of the arid regions, where grazing has always been the principal industry and where large areas of land are devoted to the production of hay.

TABLE 1.—Status of project land, 1921.

State and project.	Irrigable acres. ¹	Irrigated acres.	Cropped acres.
Arizona, Salt River.....	213,000	202,430	191,000
Arizona-California, Yuma.....	62,000	52,400	52,400
California, Orland.....	20,480	14,700	11,450
Colorado:			
Grand Valley.....	35,000	12,300	11,390
Uncompahgre.....	100,000	63,760	63,600
Idaho:			
Boise.....	143,000	111,500	103,340
King Hill.....	13,650	5,900	5,390
Minidoka.....	121,560	107,230	100,720
Montana:			
Huntley.....	31,630	18,800	18,440
Milk River.....	69,200	16,400	16,110
Sun River.....	33,680	21,750	21,090
Montana-North Dakota, Lower Yellowstone.....	42,170	19,980	19,980
Nebraska - Wyoming, North Platte.....	148,500	111,800	110,410
Nevada, Newlands.....	72,200	46,160	43,440
New Mexico, Carlsbad.....	25,000	23,810	21,620
New Mexico-Texas, Rio Grande.....	115,000	85,580	77,660
North Dakota, North Dakota pumping.....	7,650	2,080	1,960
Oregon, Umatilla.....	24,400	13,150	11,610
Oregon-California, Klamath.....	50,000	36,100	32,720
South Dakota, Belle Fourche.....	82,360	55,100	55,100
Utah, Strawberry Valley.....	52,500	32,500	31,380
Washington:			
Okanogan.....	6,500	5,650	5,330
Yakima.....	133,500	123,000	107,880
Wyoming, Shoshone.....	71,120	45,420	43,880
Total.....	1,674,100	1,227,500	1,157,900

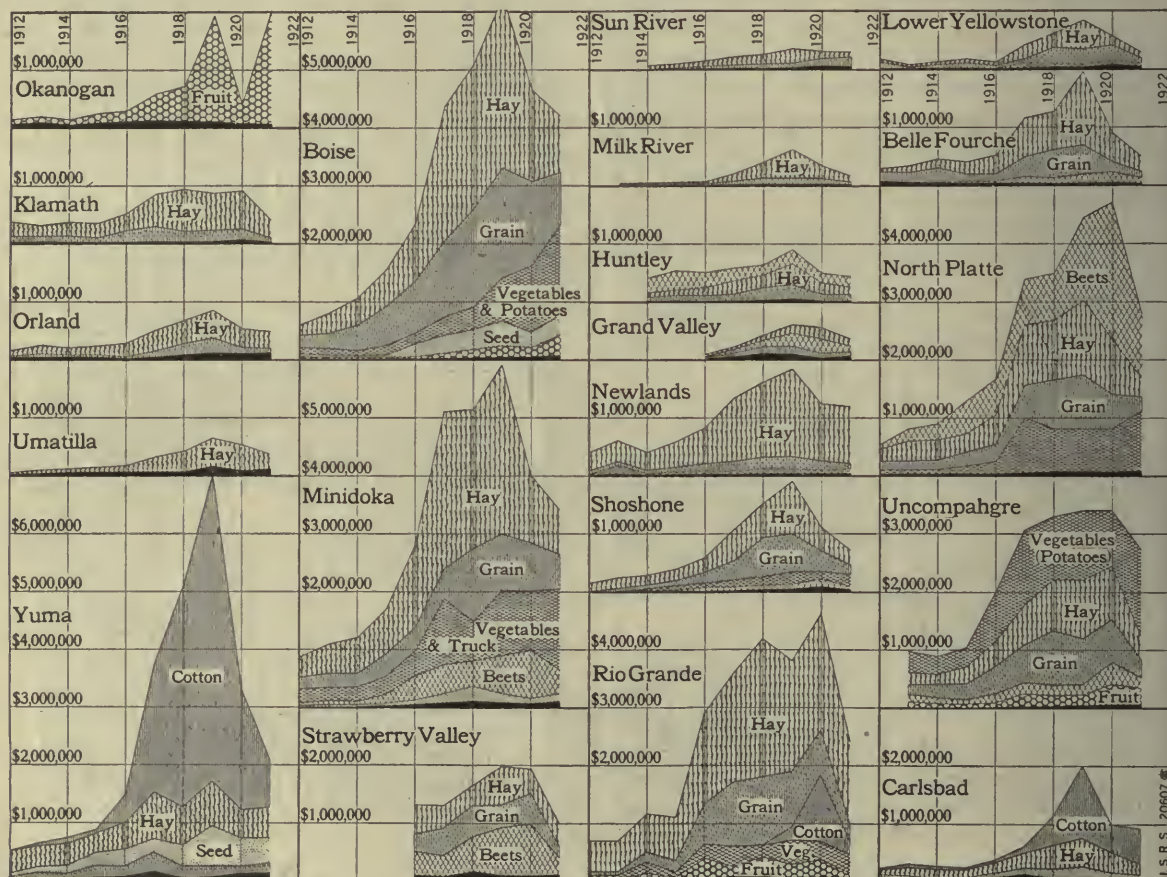
¹ Estimated.

FIG. 2.—Gross crop values of principal crops on specified projects, by years, 1912-1921.

Crop Area and Value (Fig. 2).

The character of the crops grown on each of the principal projects is shown in Figure 2, which also indicates, by years from 1912 to 1921, the total value of each class of crops raised. In each case it is to be noted that there has been a rapid increase in crop returns from 1912, culminating in 1919, and then rapidly dropping off to 1921, following in this respect the conditions which have prevailed throughout the United States.

One of the striking facts is the large extent and value of the hay and cereal crop. It is generally recognized that the use of expensive stored waters is rarely profitable in producing these crops unless they are consumed on the farm and ultimately sold as manufactured products in the form of beef, pork, mutton, butter fat, poultry, and eggs, the fertility being preserved on the farm.

The statistics upon which Figure 2 is based have been published in detail in the annual reports. They

are summarized for 1921, by acreage and value of specified crops for each project, in Tables 2 and 3.

Crop Value Per Acre (Fig. 3).

There is a wide discrepancy between the various projects in the value per acre of the products raised on the irrigated lands. This is brought out in Figure 3 in which the various projects are arranged from left to right in the increasing order of value of crops per acre, as reported for 1921. There is also indicated as a necessary correlative the average cropped acreage of the farms from which this acreage value was obtained. This brings out clearly the fact that on the farm units with large acreage the crop value per acre is relatively small, whereas, on the contrary, the crop value per acre of the small farms, particularly those devoted to raising fruits and nuts, has been very great.

On the one extreme is the Milk River project with an average cropped area per farm of 90 acres, and

TABLE 2.—Acreage irrigated and cropped, 1921, by projects and specified crops.¹

State and project.	Cereals.	Other grain and seed.	Hay and forage.	Vegetables and truck.	Fruit and nuts.	Miscellaneous.	Duplicated.	Total cropped.	Total irrigated.
Arizona, Salt River.....	38,003	24,519	80,267	9,947	3,912	60,887	26,535	191,000	202,430
Arizona-California, Yuma.....	2,705	23,060	25,105	513	102	18,425	17,510	52,400	52,400
California, Orland.....	1,089	1,939	10,584	272	1,184	167	3,785	11,450	14,700
Colorado:									
Grand Valley.....	3,961	7,103	402	257	4,866	5,199	11,390	12,300	
Uncompahgre.....	20,721	461	33,030	11,770	2,024	1,654	6,060	63,600	63,760
Idaho:									
Boise.....	37,810	6,951	57,290	6,290	2,260	154	7,415	103,340	111,500
King Hill.....	415	109	4,282	377	563	44	400	5,390	5,900
Mindoka.....									
Gravity division.....	16,632	2,079	32,897	4,163	379	2,345	1,095	57,400	60,650
Pumping division.....	12,957	1,167	17,697	7,035		4,464		43,320	46,580
Montana:									
Huntley.....	7,721	131	22,522	324		3,213	15,476	18,440	18,800
Milk River.....	3,718	245	12,326	71			250	16,110	16,400
Sun River—									
Fort Shaw division.....	1,761	176	6,478	271		14		8,700	8,910
Greenfields division.....	10,628	86	1,570	91		15		12,390	12,840
Montana-North Dakota, Lower Yellowstone	7,428	133	11,844	532		1,576	1,533	19,980	19,980
Nebraska-Wyoming, North Platte:									
N. P. C. & C. Co. lands.....	3,606		4,200	1,678		1,406		10,890	11,020
Interstate division.....	27,385	439	32,974	9,787		14,995		85,580	86,390
Fort Laramie division.....	8,786	10	1,797	707		840		12,140	12,150
Northport division.....	1,193		90	47		470		1,800	2,250
Nevada, Newlands.....	3,235		39,338	613		1,448	1,194	43,440	46,160
New Mexico, Carlsbad.....	3,466	1,445	8,227	11		18,832	10,361	21,620	23,810
New Mexico-Texas, Rio Grande.....	26,044	758	40,395	5,350	858	6,561	2,306	77,660	85,580
North Dakota, North Dakota pumping.....	371		1,812	161		16	400	1,960	2,080
Oregon, Umatilla.....	220	89	10,560	278	715	39	291	11,610	13,150
Oregon-California, Klamath.....	6,586		25,972	162				32,720	36,100
South Dakota, Belle Fourche.....	17,776	2,163	35,351	416		974	1,580	55,100	55,100
Utah, Strawberry Valley.....	9,083	76	15,561	481	284	5,895		31,380	32,500
Washington:									
Okanogan.....			1,151	111	4,736	54	722	5,330	5,650
Yakima.....									
Sunnyside division.....	10,039		49,465	9,047	13,748	1,965	3,584	80,680	94,500
Tieton division.....	4,153		15,576	1,709	9,483	305	4,026	27,200	28,500
Wyoming:									
Shoshone—									
Garland division.....	9,015	723	20,814	2,087		1,531		34,170	34,570
Frannie division.....	3,132	783	5,551	201		43		9,710	10,850
Total.....	299,639	67,542	631,829	74,904	40,505	153,203	109,722	1,157,900	1,227,500

¹ Data are for calendar year (irrigation season), except on Salt River project, where the data are for corresponding "agricultural year," October, 1920, to September, 1921.

² Figures for Fort Shaw division, Sun River project, are for 208 irrigated farms covering an irrigated acreage of 8,880, in addition to which there were irrigated in town sites 22 acres and for miscellaneous purposes, 8 acres.

³ Figures for Greenfields division, Sun River project, are for 169 irrigated farms, all but 450 acres of which produced crops.

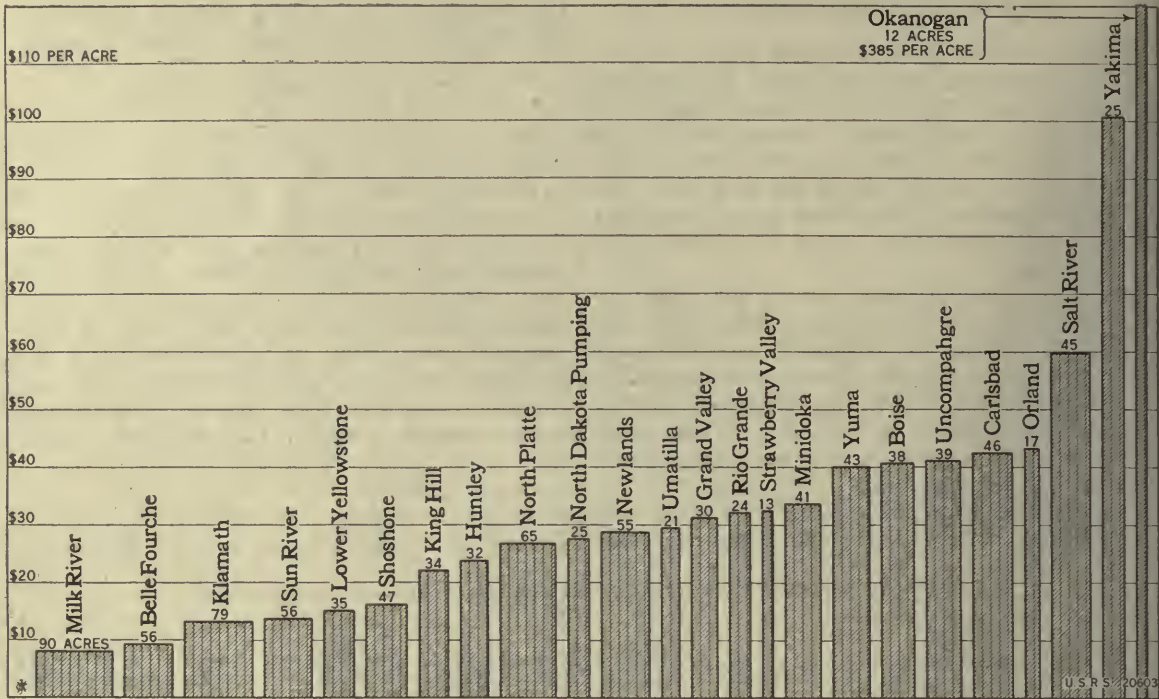


FIG. 3.—Comparison of average cropped acreage per farm and average crop value per acre on specified projects, 1921.

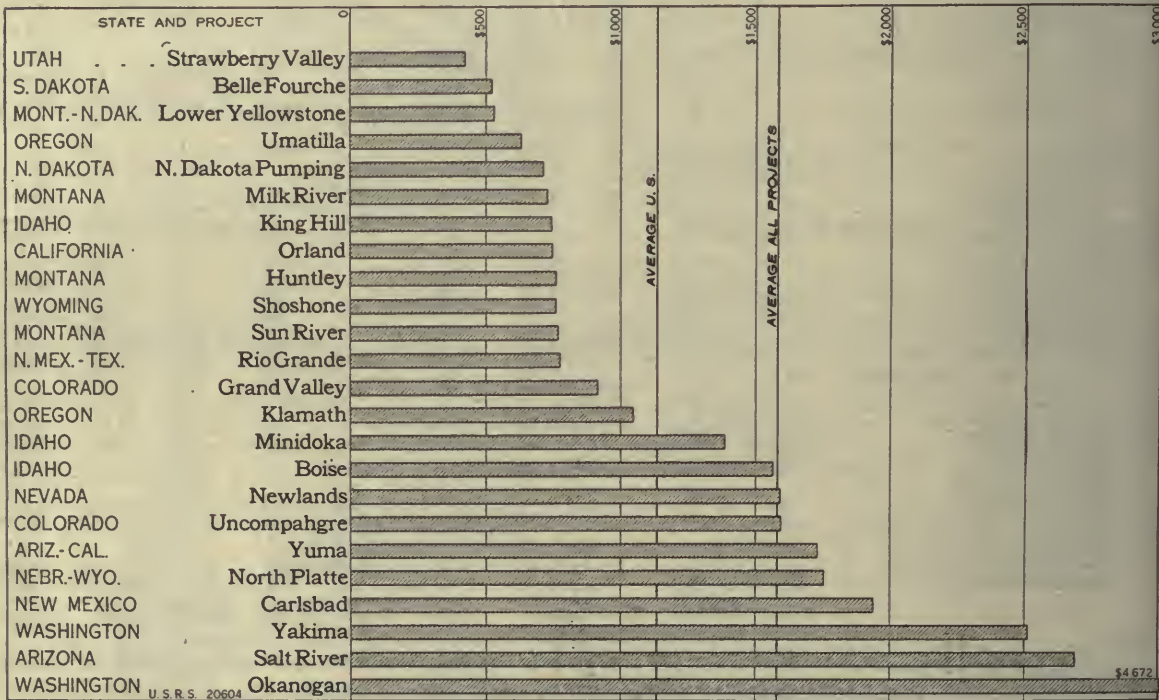


FIG. 4.—Average crop value per farm on specified projects, 1921.

TABLE 3.—Crop values, 1921, by projects and specified crops.¹

State and project.	Cereals.	Other grains and seed.	Hay and forage.	Vegetables and truck.	Fruit and nuts.	Miscellaneous.	Total.
Arizona, Salt River.....	\$948,881	\$551,686	\$2,557,709	\$1,324,089	\$1,145,632	\$4,907,383	\$11,435,380
Arizona-California, Yuma.....	32,550	633,330	466,665	42,890	10,000	912,625	2,098,060
California, Orland.....	15,623	59,640	286,504	25,260	87,408	21,375	495,810
Colorado:							
Grand Valley.....	55,530		100,750	31,713	46,473	122,264	356,730
Uncompahgre.....	342,836	6,272	383,153	1,518,659	263,879	99,501	2,614,300
Idaho:							
Boise.....	871,806	305,743	968,308	1,563,955	475,107	19,021	4,203,940
King Hill.....	7,403	2,964	66,417	39,873	2,480	73	119,210
Minidoka—							
Gravity division.....	346,221	76,285	506,096	513,383	26,805	172,350	1,641,140
Pumping division.....	258,833	35,820	227,838	965,949		279,700	1,768,140
Montana:							
Huntley.....	116,091	1,351	107,991	27,004		188,333	440,770
Milk River.....	49,553	3,385	66,021	10,871			129,830
Sun River—							
Fort Shaw division.....	23,098	3,517	63,462	26,711		652	117,440
Greenfields division.....	146,951	643	15,764	9,227		355	172,940
Montana-North Dakota, Lower Yellowstone.....	82,752	998	102,943	38,953		78,574	304,220
Nebraska-Wyoming:							
North Platte—							
N. P. C. & C. Co. lands.....	23,608		33,750	168,875		104,747	330,980
Interstate division.....	199,318	5,300	254,692	816,424		1,131,186	2,406,920
Fort Laramie division.....	67,621	450	14,358	63,488		43,013	188,930
Northport division.....	9,440		1,130	1,640		25,690	35,900
Nevada, Newlands.....	72,280		1,015,600	126,372		40,328	1,254,580
New Mexico, Carlsbad.....	28,976	19,520	190,094	2,465		678,595	919,650
New Mexico-Texas, Rio Grande.....	413,257	6,894	1,352,144	367,280	34,420	319,715	2,493,710
North Dakota, North Dakota pumping.....	3,347		26,860	20,548		3,565	54,320
Oregon, Umatilla.....	3,869	2,892	261,476	27,518	46,462	1,673	343,890
Oregon-California, Klamath.....	102,984		299,760	29,206			431,950
South Dakota, Belle Fourche.....	140,395	16,966	262,105	37,016		57,268	513,750
Utah, Strawberry Valley.....	185,138	1,780	398,217	51,083	78,850	305,522	1,020,590
Washington:							
Okanogan.....			26,930	18,590	1,996,285	9,465	2,051,270
Yakima—							
Sunnyside division.....	236,436		1,568,649	1,879,740	3,953,865	158,310	7,797,000
Tleton division.....	93,179		414,013	201,875	2,377,981	79,362	3,166,410
Wyoming:							
Shoshone—							
Garland division.....	140,306	1,865	183,511	203,759		104,019	633,460
Fannie division.....	17,933	4,036	45,657	9,705		1,729	79,080
Total.....	5,036,215	1,741,357	12,268,567	10,164,121	10,545,647	9,864,393	49,620,300

¹ Data are for calendar year (irrigation year), except on Salt River project, where data are for corresponding "agricultural year," October, 1920, to September, 1921.

a crop value, mainly from hay, of only \$8.06 per acre. On the other extreme, is the Okanogan project, with an average cropped area per farm of only 12 acres, and a crop value, mainly from fruit, of \$385 per acre.

A comparison of the first 11 projects shown on the diagram, beginning with Milk River and ending with Newlands, with the last 13, beginning with Umatilla and ending with Okanogan, gives some interesting results when the statistics of each of these two groups are combined. In the first group the average cropped acreage per farm amounts to 54.6 acres as compared with 31.9 acres for the second group. The 54.6 acres of the first group produced crops to the value of only \$19.57 per acre, or \$1,069 per farm, as compared with the 31.9 acres of the second group which produced crops to the value of \$53.72 per acre, or \$1,715 per farm. The advantage of the small farm intensively cultivated is obvious.

The drawing is based on Table 4, which gives alphabetically, by States and projects, the number of

farms, the cropped acreage both total and per farm, the total crop value, and the crop value per farm and per acre, for the season of 1921.

On the reclamation projects for the years 1912 to 1921, including the period of inflation, the average value per acre of all crops was \$47.48. The maximum was in 1919, reaching \$79.88. This dropped to nearly one-half in 1921, namely, to \$42.85 (p. 134, June RECLAMATION RECORD). An interesting comparison is afforded by the statement of the per-acre crop values in 1921, based on the United States Department of Agriculture's theoretical estimates (1) of total acreages under cultivation, and (2) of the total value of all crops. These per-acre values are given, by States, in Table 5.

In studying this table, it is seen that the average value per acre in 1921 on the reclamation projects was exceeded by only five States, namely, Connecticut, Massachusetts, Rhode Island, California, and New Jersey. Here the old and highly developed orchards, the seed farms, and other specialized agri-

cultural industries on very small farms bring about a high per-acre value.

Crop Value Per Farm (Fig. 4).

The income of the family and ability to maintain a home on the land are determined by the product per farm rather than per acre. For this reason Figure 4 has been prepared, in which the projects are arranged in the order of the crop value per farm as given in Table 4. Here the smallest crop value per farm is that of the Strawberry Valley project, Utah, of \$425. This is due to the fact that the farm units are very small—13 acres.

TABLE 4.—Summary of irrigated farms, 1921.

State and project.	Number of farms.	Cropped acreage.		Crop value.		
		Total.	Per farm.	Total.	Per farm.	Per acre.
Arizona, Salt River...	4,250	191,000	45	\$11,435,380	\$2,690	\$59.87
Arizona-California, Yuma...	1,211	52,400	43	2,093,060	1,733	40.04
California, Orland...	663	11,450	17	496,810	748	43.30
Colorado: Grand Valley...	389	11,390	30	356,730	917	31.32
Uncompahgre...	1,639	63,600	39	2,614,300	1,595	41.10
Idaho: Boise...	2,686	103,340	38	4,203,940	1,565	40.68
King Hill...	100	5,390	34	119,210	745	22.20
Minidoka—Gravity division...	1,539	57,400	37	1,641,140	1,066	28.59
Pumping division...	915	43,320	47	1,768,140	1,932	40.81
Montana: Huntley...	578	18,440	32	440,770	762	23.90
Milk River...	178	16,110	90	129,830	730	8.06
Sun River—Fort Shaw division...	208	8,700	41	117,440	564	13.49
Greenfields division...	169	12,390	73	172,940	1,023	13.96
Montana-North Dakota Lower Yellowstone...	572	19,980	35	304,220	532	15.23
Nebraska-Wyoming: North Platte—N. P. Can. & Col. Co. lands...	132	10,890	83	330,980	2,507	30.40
Interstate division...	1,340	85,580	64	2,406,920	1,796	28.12
Fort Laramie division...	190	12,140	62	188,930	994	15.56
Northport division...	2	1,800	78	35,900	1,560	20.00
Nevada, Newlands...	782	43,440	55	1,254,580	1,592	35.57
New Mexico, Carlsbad...	47	21,620	46	919,650	1,940	42.53
New Mexico - Texas, Rio Grande...	3,20	77,660	24	2,493,710	778	32.11
North Dakota, North Dakota pumping...	76	1,060	25	54,320	715	27.70
Oregon, Unatilla...	544	11,610	21	343,890	632	29.62
Oregon-California, Klamath...	41	32,720	79	431,950	1,048	13.20
South Dakota, Belle Fourche...	98	55,100	56	513,750	523	9.32
Utah, Strawberry Valley...	2,400	31,380	13	1,020,590	425	32.52
Washington: Okanogan...	43	5,330	12	2,051,270	4,672	185.00
Yakima—Sunnyside division...	3,06	80,680	26	7,797,000	2,543	96.65
Tieton division...	1,300	27,200	21	3,166,410	2,434	116.40
Wyoming: Shoshone—Garland division...	65	34,170	52	633,460	967	18.54
Frannie division...	280	9,710	35	79,080	285	8.15
Total and average	31,46	1,157,900	37	49,620,300	1,577	42.85

TABLE 5.—Value of crops per acre, by States, 1921.

Rank.	State.	Per-acre values.	Rank.	State.	Per-acre values.
1.....	Connecticut....	\$88.46	25....	Tennessee.....	\$22.21
2.....	Massachusetts..	74.21	26....	Arkansas.....	22.05
3.....	Rhode Island...	53.43	27....	Mississippi....	21.73
4.....	California.....	52.39	28....	Wisconsin.....	20.69
5.....	New Jersey.....	50.97	29....	New Mexico....	20.21
6.....	New Hampshire..	40.78	30....	Nevada.....	20.18
7.....	Maine.....	40.32	31....	Michigan.....	19.78
8.....	Arizona.....	39.01	32....	Ohio.....	18.09
9.....	North Carolina..	38.82	33....	Alabama.....	18.04
10....	Florida.....	38.54	34....	Georgia.....	15.93
11....	Washington.....	33.98	35....	Texas.....	15.91
12....	Vermont.....	33.92	36....	Illinois.....	14.19
13....	New York.....	30.14	37....	Indiana.....	13.83
14....	West Virginia...	29.20	38....	Wyoming.....	13.58
15....	Maryland.....	27.68	39....	Colorado.....	13.36
16....	Pennsylvania...	27.40	40....	Missouri.....	12.45
17....	Kentucky.....	25.02	41....	Iowa.....	12.04
18....	Delaware.....	24.54	42....	Minnesota....	11.54
19....	Oregon.....	24.43	43....	Montana.....	11.67
20....	Utah.....	23.81	44....	Oklahoma.....	11.50
21....	Delaware.....	23.68	45....	Kansas.....	9.99
22....	Louisiana.....	23.67	46....	Nebraska.....	9.09
23....	South Carolina..	23.53	47....	North Dakota..	7.50
24....	Idaho.....	22.22	48....	South Dakota..	7.17

Next in order is the Belle Fourche project, South Dakota, with a crop value per farm of \$523, but with relatively large farm units—56 acres—devoted mainly to hay production.

On this diagram, Figure 4, is indicated the acreage crop value per farm of \$1,132.56 for the United States as a whole (on the basis of 78 improved acres per

GROSS CROP VALUE FOR TEN YEARS, 1912-1921

PER CENT OF TOTAL

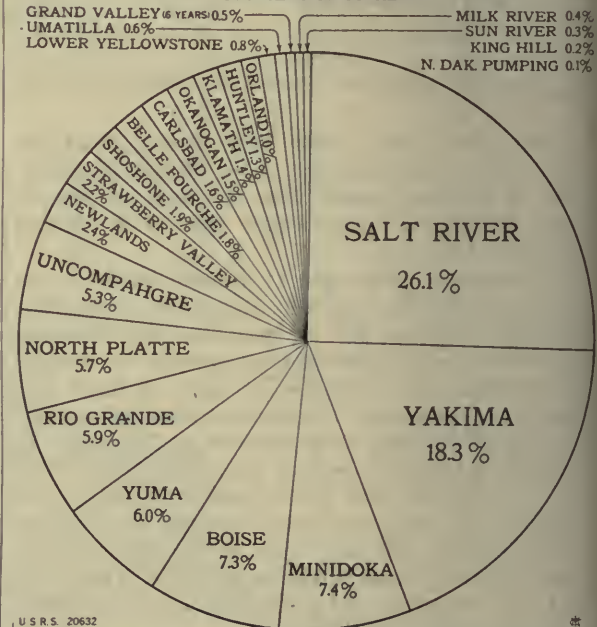


FIG. 5.—Per cent which the gross crop value for 10 years on each specified project represents of the total gross crop value on all projects for the same period.

¹ For crops in full production excluding 7,874 acres of wild grass pasture and 3,170 acres otherwise not in full production. For all crops, \$28.88.

farm and an average value per acre of the leading crops of \$14.52), and also the average crop value per farm of \$1,577 for all the projects of the service.

Gross Crop Values (Fig. 5).

The wide difference among the gross crop values received from the irrigated farms is illustrated by Table 6, which gives the totals for the 10 years 1912 to 1921 of crop values obtained from the lands irrigated under the terms of the reclamation act, and also the value per acre for the same period. The details of these figures are given in the various annual reports. The projects are arranged in order of crop totals. These totals do not include the value of live stock which would increase them by at least 20 per cent.

TABLE 6.—Gross crop value for 10 years, 1912 to 1921.

Project.	Amount.	Per cent of total.	Value per acre.
1. Salt River, Arizona.....	\$111,101,108	26.1	\$62.37
2. Yakima, Washington.....	77,879,532	18.3	93.21
3. Minidoka, Idaho.....	31,403,562	7.4	37.07
4. Boise, Idaho.....	30,916,016	7.3	40.26
5. Yuma, Arizona-Calif.....	25,422,344	6.0	74.00
6. Rio Grande, New Mexico-Texas.	25,341,253	5.9	48.13
7. North Platte, Nebraska-Wyo.....	24,021,675	5.7	30.00
8. Uncompahgre, Colorado.....	22,170,875	5.3	44.56
9. Newlands, Nevada.....	10,300,370	2.4	25.27
10. Strawberry Valley, Utah ¹	9,192,756	2.2	53.96
11. Shoshone, Wyoming.....	7,953,348	1.9	25.96
12. Belle Fourche, South Dakota.....	7,900,526	1.8	17.14
13. Carlsbad, New Mexico.....	6,966,991	1.6	45.00
14. Okanogan, Washington.....	6,694,390	1.5	144.25
15. Klamath, Oregon-Calif.....	5,880,537	1.4	20.31
16. Huntley, Montana.....	5,679,100	1.3	31.72
17. Orland, California.....	4,246,476	1.0	48.95
18. Lower Yellowstone, Mont.-N. Dak.	3,603,306	0.8	24.75
19. Umatilla, Oregon.....	2,703,140	.6	45.51
20. Grand Valley, Colorado ¹	2,120,681	.5	48.74
21. Milk River, Montana.....	1,903,138	.4	16.80
22. Sun River, Montana.....	1,750,158	.3	20.92
23. King Hill, Idaho ²	652,420	.2	39.21
24. North Dakota pumping, North Dakota ²	256,418	.1	29.22
Total.....	426,090,120	100.0	47.43

¹ Six years.

² Five years.

The leading project, so far as total crop receipts is concerned, is the Salt River project, Arizona, from which the value of the crops produced during a period of 10 years is \$111,101,108, or over a fourth of all the crop receipts from all the 24 projects combined. Next in order, but a long way behind, is the Yakima project of Washington, with nearly \$78,000,000 of crop values, and then the two Idaho projects, fairly comparable, namely, Minidoka and Boise, each with a total crop value in 10 years of about \$31,000,000. Figure 5 shows the percentage which the crop value for 10 years on each project represents of the total crop value for the period.

Repayments (Fig. 6).

The reclamation act as approved on June 17, 1902, provides that the Secretary of the Interior shall de-

termine the construction charges which will be made per acre for the water for the irrigable lands, the number of annual installments, not exceeding 10, in which the charges shall be paid, and the time when such commence, these charges being determined with the view of returning to the reclamation fund the estimated cost of construction of the project. It was assumed that after the works were completed and the homestead entrymen and others had begun the cultivation of the soil it would be practicable for them to repay in 10 years the cost of bringing water to the land. This was, however, later to be determined to be impracticable under the then existing conditions, and 12 years after the passage of the reclamation act, at a time when the investment up to and including 1913 had amounted to \$75,000,000 and the aggregate crop return for 1913 had reached \$15,700,000, an amendment was passed, dated August 13, 1914, increasing the time from 10 to 20 years.

TABLE 7.—Construction repayments to April 30, 1922, arranged in order of magnitude.

Project.	Repayment.	Per cent.
1. Yakima, Washington.....	\$2,743,400	21.4
2. Minidoka, Idaho.....	2,352,900	18.4
3. North Platte, Nebraska-Wyo.....	1,541,500	12.0
4. Boise, Idaho.....	1,099,400	8.6
5. Yuma, Arizona-Calif.....	820,700	6.4
6. Salt River, Arizona.....	609,900	4.7
7. Shoshone, Wyoming.....	578,300	4.6
8. Newlands, Nevada.....	484,400	3.8
9. Klamath, Oregon-Calif.....	475,900	3.7
10. Belle Fourche, South Dakota.....	456,100	3.5
11. Huntley, Montana.....	343,000	2.7
12. Carlsbad, New Mexico.....	319,200	2.5
13. Strawberry Valley, Utah.....	309,800	2.4
14. Umatilla, Oregon.....	301,200	2.3
15. Orland, California.....	168,700	1.3
16. Sun River, Montana.....	134,600	1.0
17. Lower Yellowstone, Montana-N. Dak.....	41,100	.4
18. Okanogan, Washington.....	40,200	.3
19. Grand Valley, Colorado.....	0	0
20. Uncompahgre, Colorado.....	0	0
21. King Hill, Idaho.....	0	0
22. Milk River and St. Mary storage, Montana.....	0	0
23. Rio Grande, New Mexico-Texas.....	0	0
24. North Dakota pumping (Williston).....	0	0
Total.....	12,820,300	100.0

¹ Estimated at \$13,000,000 on June 30, 1922.

Under this extension act persons thereafter making entry were required to pay down at the time of making water-right application 5 per cent of the construction charge as an initial installment, and the balance in 15 annual installments beginning 5 years later and continuing at the rate of 5 per cent for the first 5 years and 7 per cent for the balance of the period. Those persons, however, who had already begun to pay were permitted to continue payment at the rate of 2 per cent for 4 years, 4 per cent for 2 years, and 6 per cent for 14 years.

By reason of this extension, the construction repayments have been less than was anticipated would be the case, and as a consequence the amount of money available for reinvestment for completion of

works in hand or beginning of new enterprises has been quite small.

REPAYMENTS TO JUNE 30, 1922 ARRANGED IN ORDER OF MAGNITUDE

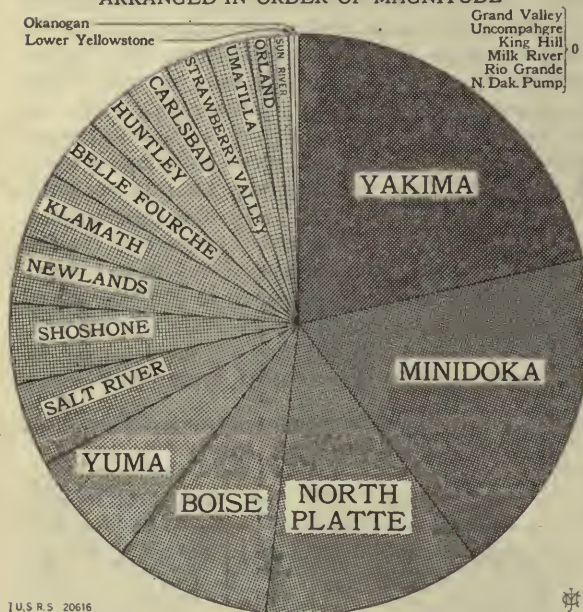


FIG. 6.—Total construction repayments by specified projects, in order of magnitude.

Figure 6 illustrates the gross amount of construction repayments and the proportion from each of the several projects. This is based on Table 7, which gives in the order of magnitude of repayments the amount from each project and the percentage which this bears to the whole amount repaid.

Repayments Compared to Net Construction Cost (Fig. 7).

In comparing repayments shown in Table 7 with net construction cost, it is seen that there is a great difference between the various projects in this regard. This is brought out by Figure 7, making a comparison of the percentages based on Table 8. It will be seen that the amount of repayment has no definite relation to the amount of the net construction cost. The Yakima project which stands at the head of the list in the matter of total repayments, having repaid \$2,743,400, has a net cost of construction of \$10,804,600, ranking fourth in this respect.

The second project in amount of repayment is the Minidoka, with a total repayment of \$2,352,900 against a net construction cost of \$6,849,000, or the eighth in the order of magnitude.

TABLE 8.—Repayments arranged according to per cent of net construction cost.

Project.	Repayment.	Net construction cost.	Per cent of cost.
1. Minidoka, Idaho.....	\$2,352,900	\$6,849,000	34.4
2. Yakima, Washington.....	2,743,400	10,804,600	25.3
3. Huntley, Montana.....	343,000	1,463,700	23.5
4. Carlsbad, New Mexico.....	319,200	1,398,000	22.8
5. Orland, California.....	168,700	1,055,700	15.1
6. Klamath, Oregon-Calif.....	475,900	3,582,500	13.3
7. Belle Fourche, South Dakota.....	456,100	3,329,100	12.0
8. North Platte, Nebraska-Wyo.....	1,541,500	12,809,600	12.0
9. Umatilla, Oregon.....	301,200	2,785,200	10.8
10. Yuma, Arizona-Calif.....	820,700	8,931,400	9.2
11. Strawberry Valley, Utah.....	309,800	3,473,100	8.9
12. Boise, Idaho.....	1,099,400	12,364,500	8.8
13. Shoshone, Wyoming.....	578,300	7,463,900	7.7
14. Newlands, Nevada.....	464,400	6,028,200	7.3
15. Salt River, Arizona.....	609,900	10,548,100	5.8
16. Sun River, Montana.....	134,600	3,928,500	3.4
17. Okanogan, Washington.....	40,200	1,384,100	2.9
18. Lower Yellowstone, Mont.-N. Dak.....	41,100	3,528,100	1.2
19. Grand Valley, Colorado.....	0	3,746,400	0
20. Uncompahgre, Colorado.....	0	6,745,600	0
21. King Hill, Idaho.....	0	1,452,500	0
22. Milk River, Montana.....	0	6,510,800	0
23. Rio Grande, N. Mex.-Tex.....	0	11,204,800	0
24. North Dakota pumping (Williston).....	0	460,600	0
Total.....	12,820,300	132,653,900	9.7

¹ Estimated at \$13,000,000 on June 30, 1922.

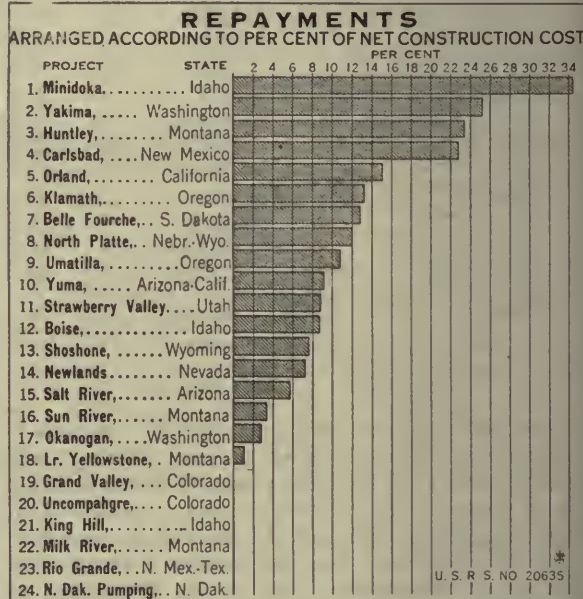


FIG. 7.—Per cent which repayments by each specified project represent of project net construction cost.

Repayments Compared to Crop Returns (Fig. 8).

The amount of repayments bears no evident relation to the total crop values. It might be inferred at first that the oldest regions and most prosperous communities would have repaid the largest amount.

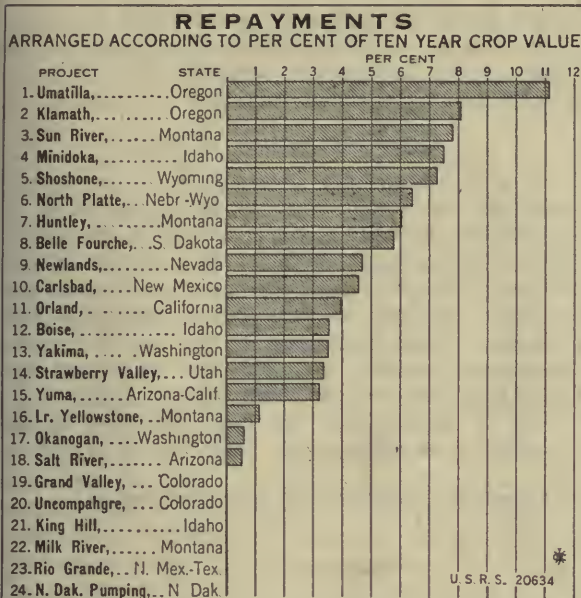


FIG. 8.—Per cent which repayments by each specified project represent of project 10-year gross crop value.

As a matter of fact, arranging the projects in the order of repayment, as compared with gross crop values received, smaller and less prosperous localities may be said to have made the largest propor-

TABLE 9.—Repayments arranged according to per cent of 10-year crop value.

Project.	Repay-ments.	Crops.	Per cent.
1. Umatilla, Oregon.....	\$301,200	\$2,703,140	11.1
2. Klamath, Oregon-California.....	475,900	5,880,537	8.1
3. Sun River, Montana.....	134,600	1,750,158	7.8
4. Minidoka, Idaho.....	2,352,900	31,403,562	7.5
5. Shoshone, Wyoming.....	578,300	7,953,348	7.3
6. North Platte, Nebraska-Wyoming.....	1,541,500	24,021,675	6.4
7. Huntley, Montana.....	343,000	5,679,100	6.0
8. Belle Fourche, South Dakota.....	456,100	7,900,526	5.8
9. Newlands, Nevada.....	484,400	10,300,370	4.7
10. Carlsbad, New Mexico.....	319,200	6,966,991	4.6
11. Orland, California.....	168,700	4,246,476	4.0
12. Boise, Idaho.....	1,099,400	30,916,016	3.6
13. Yakima, Washington.....	2,743,400	77,879,532	3.5
14. Strawberry Valley, Utah.....	309,800	19,192,756	3.4
15. Yuma, Arizona-California.....	820,700	25,422,344	3.2
16. Lower Yellowstone, Montana-North Dakota.....	41,100	3,603,306	1.1
17. Okanogan, Washington.....	40,200	6,694,390	.6
18. Salt River, Arizona.....	609,900	111,101,108	.6
19. Grand Valley, Colorado.....	0	2,120,681	0
20. Uncompahgre, Colorado.....	0	22,170,875	0
21. King Hill, Idaho.....	0	652,420	0
22. Milk River, Montana.....	0	1,903,138	0
23. Rio Grande, New Mexico-Texas.....	0	25,341,253	0
24. North Dakota pumping (Williston), North Dakota.....	0	228,418	0
Total.....	\$12,820,300	426,090,120	3.0

¹ Six years.

² Five years.

³ Estimated at \$13,000,000 on June 30, 1922.

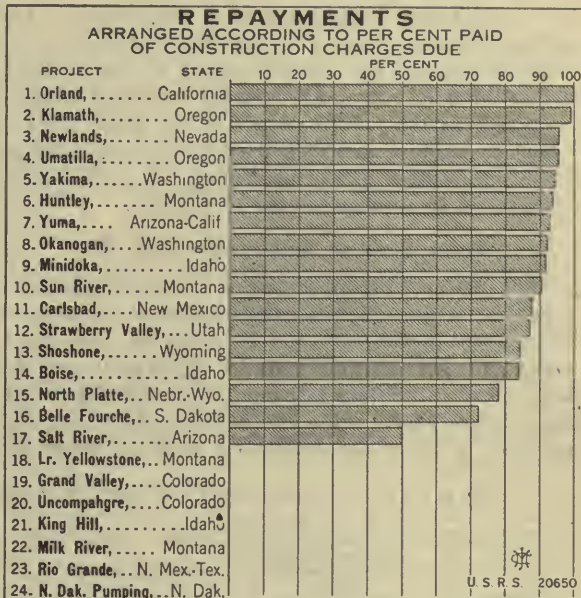


FIG. 9.—Per cent which repayments by each specified project represent of construction charges due on that project.

tional payment. Some of the projects, viz, Grand Valley, Colorado; Uncompahgre, Colorado; King Hill, Idaho; Milk River, Montana; Rio Grande, New Mex-

TABLE 10.—Repayments arranged according to per cent paid of construction charges due.

Project.	Construc-tion charges due.	Repay-ments.	Per cent paid.
1. Orland, California.....	\$168,700	\$168,700	100.0
2. Klamath, Oregon-California.....	479,600	475,900	99.2
3. Newlands, Nevada.....	506,400	484,400	95.6
4. Umatilla, Oregon.....	315,000	301,200	95.6
5. Yakima, Washington.....	2,902,400	2,743,400	94.5
6. Huntley, Montana.....	365,700	343,000	93.8
7. Yuma, Arizona-California.....	885,500	820,700	92.7
8. Okanogan, Washington.....	43,600	40,200	92.2
9. Minidoka, Idaho.....	2,570,500	2,352,900	91.5
10. Sun River, Montana.....	148,800	134,600	90.4
11. Carlsbad, New Mexico.....	364,400	319,200	87.6
12. Strawberry Valley, Utah.....	355,800	309,800	87.1
13. Shoshone, Wyoming.....	684,800	578,300	84.4
14. Boise, Idaho.....	1,307,500	1,099,400	84.1
15. North Platte, Nebraska-Wyoming.....	1,980,100	1,541,500	77.8
16. Belle Fourche, South Dakota.....	631,500	456,100	72.2
17. Salt River, Arizona.....	1,219,900	609,900	50.0
18. Lower Yellowstone, Montana-North Dakota.....	141,100	141,100	100.0
19. Grand Valley, Colorado.....	0	0	0
20. Uncompahgre, Colorado.....	0	0	0
21. King Hill, Idaho.....	76,700	0	0
22. Milk River, Montana.....	0	0	0
23. Rio Grande, New Mexico-Texas.....	0	0	0
24. North Dakota pumping, North Dakota.....	0	0	0
Total.....	15,048,000	\$12,820,300	85.2

¹ Accrued and unpaid charges canceled under contracts with irrigation districts, payment on construction charges to begin again in March, 1924.

² Estimated at \$13,000,000 on June 30, 1922.

ico; and North Dakota pumping (Williston), have not yet begun to repay the cost of construction.

The conditions are brought out by Figure 8, which shows the percentage of repayment compared to gross crop returns for the 10 years 1912 to 1921. This is based on Table 9, in which the projects are arranged in the proportion of the percentage of repayment to the gross crop returns for the 10 years.

Promptness of Repayment (Fig. 9).

Table 10 and Figure 9 give a list of the projects arranged in the order of completeness of payment of the amount which was due on April 30, 1922, illustrating the degree of promptness of payment. At the head of the list stands Orland, a community which has always taken pride in the immediate and full payment of all of the obligations incurred under the

terms of the reclamation act, in this way developing a deep sense of gratitude and appreciation on the part of the Government officials. Next in order come Klamath, Newlands, Umatilla, and Yakima.

Revolving Feature of Fund.

It is important that a careful study be made of the conditions which affect the rate of return of the investment, or what is commonly called the revolution of the reclamation fund. It is evident from a study of the data here presented and particularly of Table 10, that, as indicated by Secretary Fall, the slow return from some of the projects has not been based directly upon physical conditions; that is, has not been directly controlled by climate, soils, crops, or markets, but has been influenced by less tangible conditions which have been classed as

TABLE 11.—*Net construction cost, gross crop value, construction repayments, rank of specified projects.*

State and project.	Net construction cost to Apr. 30, 1922.		Gross crop value, 10 years.				Repayment to Apr. 30, 1922.								
	Total.	Rank.	Total.	Rank.	Per acre cropped.	Rank.	Total.	Per cent of total re-pay-ment.	Rank.	Per cent of project cost.	Rank.	Per cent of project crop value.	Rank.	Per cent paid of con-struction charges due.	Rank.
Arizona, Salt River	\$10,548,100	5	\$111,101,108	1	\$62.37	4	\$609,900	4.7	6	5.8	15	0.6	18	50.0	17
Arizona-California, Yuma.....	8,931,400	6	25,422,344	5	74.00	3	820,700	6.4	5	9.2	10	3.2	15	92.7	7
California, Orland.....	1,055,700	23	4,246,476	17	43.95	6	168,700	1.3	15	15.1	5	4.0	11	100.0	1
Colorado:															
Grand Valley..	3,746,400	13	2,120,681	20	48.74	7	0	0	.....	0	.....	0	.....	0	.....
Uncompahgre..	6,745,600	9	22,170,875	8	44.56	11	0	0	.....	0	.....	0	0	0	.....
Idaho:															
Bols.....	12,364,500	2	30,916,016	4	40.26	12	1,099,400	8.6	4	8.8	12	3.6	12	84.1	14
King Hill.....	1,452,500	20	652,420	23	39.21	13	0	0	.....	0	.....	0	.....	0	.....
Minidoka.....	6,849,000	8	31,403,562	3	37.07	14	2,352,900	18.4	2	34.4	1	7.5	4	91.5	9
Montana:															
Huntley.....	1,463,700	19	5,679,100	16	31.72	15	343,000	2.7	11	23.5	3	6.0	7	93.8	6
Milk River.....	6,510,800	11	1,903,138	21	16.80	24	0	0	.....	0	.....	0	.....	0	.....
Sun River.....	3,928,500	12	1,750,158	22	20.92	21	134,600	1.0	16	3.4	16	7.8	3	90.4	10
Montana-North Dakota, Lower Yellowstone.....	3,528,100	16	3,603,306	18	24.75	20	41,100	.4	17	1.2	18	1.1	16	.....	.....
Nebraska, North Platte.....	12,809,600	1	24,021,675	7	30.00	16	1,541,500	12.0	3	12.0	8	6.4	6	77.8	15
Nevada, Newlands.....	6,628,200	10	10,300,370	9	25.27	19	484,400	3.8	8	7.3	14	4.7	9	95.6	3
New Mexico, Carlsbad.....	1,398,000	21	6,966,991	13	45.00	10	319,200	2.5	12	22.8	4	4.6	10	87.6	11
New Mexico-Texas, Rio Grande.....	11,204,800	3	25,341,253	6	48.13	8	0	0	.....	0	.....	0	.....	0	.....
North Dakota, North Dakota pumping (Williston).....	460,600	24	286,418	24	29.22	17	0	0	.....	0	.....	0	.....	0	.....
Oregon, Umatilla.....	2,786,200	18	2,703,140	19	45.51	9	301,200	2.3	14	10.8	9	11.1	1	95.6	4
Oregon-California, Klamath.....	3,582,500	14	5,880,537	15	20.31	22	475,900	3.7	9	13.3	6	8.1	2	99.2	2
South Dakota, Belle Fourche.....	3,529,100	15	7,900,526	12	17.14	23	456,100	3.5	10	12.9	7	5.8	8	72.2	16
Utah, Strawberry Valley.....	3,478,100	17	9,192,756	10	53.96	5	309,800	2.4	13	8.9	11	3.4	14	87.1	12
Washington:															
Okanogan.....	1,384,100	22	6,694,390	14	144.25	1	40,200	.3	18	2.9	17	.6	17	92.2	8
Yakima.....	10,804,500	4	77,879,532	2	93.21	2	2,743,400	21.4	1	25.3	2	3.5	13	94.5	5
Wyoming, Shoshone.....	7,463,900	7	7,953,348	11	25.96	18	578,300	4.6	7	7.7	13	7.3	5	84.4	13
Total.....	132,653,900	.....	426,090,120	.....	47.48	.....	12,820,300	100.0	.....	.....	.....	.....	.....	85.2	.....

¹ Six years.

² Five years.

sociological, or have been included under the term of "morale," that is of the willingness on the part of individuals and communities to make certain sacrifices or endure discomforts in order to pay these moneys to the Government, so that in turn other peoples and communities might share in the benefits of the reclamation act.

In the accompanying Table 11 are given in alphabetical order, by States, the projects with net cost of construction, gross crop values received during 10 years, and the repayments or rate of revolution of the fund. This is in effect a summing up of the Tables 6, 7, 8, 9, and 10, each of which is intended to emphasize one of these important details of relation of repayments to the total debt and to the total earnings of each project.

Table 11 gives not only the total net cost, repayments, and crop values, but there is indicated after these tables the relative rank of each of the projects in respect to the magnitude of these amounts. Thus, in the case of the Salt River project, Arizona, although it stands number 1 in gross crop values, it is number 5 in relative cost of construction, number 4 in acreage value of crops received during the 10 years, number 6 in the list of amount of repayments, number 15 in percentage of cost repaid, number 18 in the ratio which the repayment bears to the total crop value, and practically at the foot of the list, or number 17, in the percentage paid of construction charges due. On the other hand, among the projects less naturally favored, is Huntley, Montana, which is number 19 in total construction cost, number 16 in gross crop values, but number 7 on the basis of the percentage which repayments are of total crop values, number 3 in repayments of construction costs, and number 6 on the percentage repaid of construction charges due. A study of Table 11 indicates, as above stated, that there is no apparent connection between the cost, the receipts by the farmers, and the repayments, the whole being affected more largely by what may be termed artificial, legal, or psychological conditions.

Figure 10 (back page) illustrates by cog wheels and pointers the condition of revolution of the reclamation fund. The large central wheel represents by its area the total net construction cost. The smaller surrounding wheels show also by their areas the relative cost of each project. The aggregate of the areas of these circles is intended to be equal to the area of the large central circle. Beginning with Minidoka, it is seen that the hand or index revolving on the face of the Minidoka circle has already passed around over one-third of the face of the small cog wheel, indicating that in the case of this project 34.4 per cent of the cost of construction—that is, of the payment for the water—has already been made. Next to this is a larger wheel indicating a larger water cost and a less proportional repayment in the case of Yakima,

namely, of 25.3 per cent. And so on around the circle. In the case of the large inner circle, the pointer is estimated to be driven in the opposite direction, covering in the aggregate about one-tenth of the area of the large circle, and indicating that up to the present time about 10 per cent of the cost of providing water for the lands has been repaid by the landowners.

MR. WATER USER! CAN YOU ANSWER TWO QUESTIONS?

1. *How, under the law, can the Reclamation Service help you to attain a higher standard of success in the future than in the past?*
2. *What do you think is the thing of first importance to be done for the upbuilding of your community as a whole?*

Suppose we start with the general proposition that the interests of the water users and the Reclamation Service are identical. No matter how excellent from an engineering standpoint the works of the service may be, unless the people who use those works are making successes of their lives in building up happy and contented homes on the soil and becoming each year larger factors in the improvement of the economic life of the Nation, the ultimate goal for which we should all be striving has not been attained.

In general it will be agreed by practically all who have given the matter mature thought that there is ground for little criticism of the works of the service. They stand as monuments to the devotion to an ideal on the part of the men who have given them birth.

It is equally true that little criticism can be made of the part taken by the water users in utilizing these works in the transformation of the desert to productive areas of agricultural prosperity.

Let us admit frankly that there is always room for improvement. If mistakes have been made by the service, the service should be the first to profit by the mistakes with a view to their avoidance in future work. So, too, the mistakes of certain water users, however few, may be such as to hamper the forward movement of the project as a whole and necessarily, therefore, demand study and analysis with a view to rectifying them and bringing the project to the point where there is no relaxation in the steady march to success.

The Reclamation Service will welcome constructive replies to these two questions from individual water users, civic organizations, women's clubs, and others on our projects. If the response is such as we hope it will be, there should be no question that this cross-section of the views of our thousands of water users will be of the greatest aid in carrying out constructive plans for the betterment of conditions on the projects.

THE IMPORTANCE OF YIELD IN THE ECONOMICAL PRODUCTION OF SUGAR BEETS ON RECLAMATION SERVICE PROJECTS.

By A. C. Cooley, Agriculturist in Charge, Office of Demonstrations on Reclamation Projects.

SUGAR beets are one of the principal crops grown on many of the Reclamation Service projects. The last published annual report of the Reclamation Service, which covers the cropping season for 1920, shows that 10 of the 24 projects listed grew sugar beets in commercial quantities during that season. There were planted on these 10 projects 47,160 acres of beets, which yielded 455,180 tons and for which the grower received in the neighborhood of five and one-half million dollars. This will give some idea of the size and value of the industry.

In going over the crop reports for the different projects the one thing which is very noticeable is the great variation in yields. The average yield varied in 1920 from 4.8 tons on the Frannie Division of the Shoshone project to 15.9 tons on the Tieton Division of the Yakima project, with an average yield for all projects of 9.6 tons. This wide spread is found not only between projects but it is often even more outstanding between farms on the same project.

This question of yield in the economical production of a crop is far more important than many farmers realize. It is a matter to which they can well afford to give more attention. The variation in cost per acre, in growing sugar beets where the overhead is the same, is, outside of the hauling charge, practically no more for a yield of 15 tons than it is for a yield of 5 tons, but the cost per ton for the smaller yields is vastly more. For the purpose of calling attention to the cost items connected with the production of an acre of sugar beets up to the time they are ready for hauling, it may be well to insert a table in which the various items of cost are enumerated.

It will be noted in the table that the items have been classified and arranged under Overhead, Material, and Labor costs. In arriving at the costs of the different items, data gathered by the Offices of Western Irrigation Agriculture and Farm Management, United States Department of Agriculture, have been used. It probably should be made clear that, although the costs in the table are practically correct and will give one a good idea of the cost of growing sugar beets, they are estimates and not actual costs. It is realized that the cost of production will vary between sections and also between farms in the same section.

To illustrate the importance of yield in relation to the cost of production let us assume that on a certain farm "A" the cost items for growing an acre of sugar beets were given in the table and that the yield was 10 tons. The total cost of producing the

Estimated cost of growing an acre of sugar beets.

Overhead costs:	
Insurance and taxes-----	\$1.25
Interest or land rental-----	10.00
Machinery (use and depreciation)-----	2.75
Miscellaneous-----	1.00
	\$15.00
Material costs:	
Seed-----	2.10
Manure on land-----	5.25
Water-----	.85
	8.20
Labor costs:	
Plowing-----	2.80
Disking-----	1.00
Leveling-----	.80
Harrowing-----	1.00
Rolling-----	.50
Ditch cleaning-----	.25
Planting-----	.40
Cultivating-----	2.00
Contract labor (blocking, thinning, hoeing, pulling, and topping)---	18.00
Furrowing-----	.50
Irrigating-----	1.40
Digging-----	2.40
	31.05
Total cost per acre-----	54.25

10 tons of beets would be \$54.25, or \$5.43 per ton. Suppose now that by the operator of farm "A" paying more attention to the preparation of the seed bed and the time of planting and thinning, he could have made his land yield 15 tons per acre instead of 10 tons. This increase of 5 tons per acre would have reduced his cost per ton from \$5.43 to \$3.62, a difference of \$1.81 per ton or a saving of \$27.15 per acre. On 10 acres of beets at this rate he would have realized \$271.50 more. The beet grower may contend probably that the extra work required to get the additional yield greatly increases the expense. This, however, is not the case. The increase in expense is very small and is in no way comparable with the increased returns which result from the extra work. For example, considerable extra work in the way of finishing touches could be put on a seed bed for an additional expense of \$5 per acre. Even at this amount the increased tonnage would be produced at \$1 per ton. It is well to remember that it is the few extra tons in yield that help to keep the farmer's balance on the right side of the ledger, just as it is the use

of the hang straps in the street car and the standing room in the theater that pay the big profits.

James A. Holden, superintendent of the Scottsbluff Experiment Farm, in his annual report for 1919, in discussing the cost per acre of producing sugar beets on the North Platte project, makes the following interesting statement: "It is generally conceded that it requires a 9-ton yield of beets to pay expenses. Anything above 9 tons is profit, while anything under 9 tons is loss. On this basis—

A yield of 9 tons pays expenses.

A yield of 11 tons pays expenses plus 2 tons for profit.

A yield of 12 tons pays expenses plus 3 tons for profit.

A yield of 15 tons pays expenses plus 6 tons for profit.

A yield of 18 tons pays expenses plus 9 tons for profit.

"This statement indicates that the profit from a 15-ton yield is twice as much as from a 12-ton yield; the profit from an 18-ton yield being four and one-half times that from a yield of 11 tons. An acre of beets that yields 18 tons gives the same net profit as the yield from $4\frac{1}{2}$ acres that produce 11 tons per acre."

Mr. Holden's statement brings to the attention of the grower in a very striking way the importance of yield. Owing to this importance there are certain factors influencing yield which the grower can ill-afford to overlook. It is not generally known that delayed planting after the seed bed is ready affects the yield. Tests conducted by the office of Western Irrigation Agriculture at its Scottsbluff Experiment Farm, on delayed planting showed that plantings delayed four weeks after the seed bed was ready gave a yield of 10.57 tons; plantings made three weeks after, 11.33 tons; and plantings two weeks after, 12.53 tons, whereas plantings made the next day after gave a yield of 14.30 tons. This is a difference in yield of 3.73 tons in favor of the early planting, between the plantings made four weeks after the land was ready and those made the next day after. No hard and fast rule can be adopted for the best time to plant, as much depends upon the weather. Planting time may vary several weeks from year to year; however, it is important to keep in mind that the earlier the grower can plant after he is able to get his seed bed in proper condition the better chances he has for a good yield. Delayed planting cuts down the growing season and allows the weeds to get a start and the seed bed to dry out.

These tests indicate that where a large acreage is to be planted it is better to prepare part of the land at a time, then plant, instead of preparing it all before any planting is done. Planting at different times enables the farmer also to take care of his thinning to better advantage. The beets are not all

needing attention at the same time, so that the thinning can be distributed over several days instead of crowded into one or two. Very often sufficient labor is not available to thin a large acreage as soon as it should be thinned, and time of thinning is important. Every day it is delayed after the beets are ready has its influence on cutting down the yield. At the Scotts Bluff Experiment Farm tests on time of thinning have been conducted for three years, and the average results show that where the thinning was delayed 10 days the yield was reduced 1.61 tons per acre, and with a delay of 20 days it was reduced 5.09 tons per acre. The beets thinned at the proper time had an average yield for the three years of 18.40 tons per acre; those delayed 10 days averaged 16.8, and those delayed 20 days, 13.32. On the basis of these results, a 20-acre field of beets thinned at the proper time will yield the same tonnage as 27.6 acres thinned 20 days later. Stating it in terms of dollars and cents, a field of beets thinned at the right time will return to the grower \$30.50 more per acre than when thinned 20 days later. This would mean an extra profit of \$610 on the 20 acres.

Time of planting and thinning are important, but are not the only factors influencing yield that should receive attention. The successful beet grower knows the value of a well-prepared seed bed. He appreciates that germination and stand are prerequisites to a large tonnage, and in order to expect either he must have his seed bed in a high state of tilth and the necessary amount of moisture in his soil. Another thing that contributes probably as much as any other to the farmer's troubles and cuts down his yields is a poorly leveled field. It prevents a proper distribution of his irrigation water. In the low spots the water accumulates and drowns out the beets; on the high spots the irrigator is unable to get the water, and here the beets suffer or die from a lack of it. It is also very necessary to have the water applied at the right time and in the right way. The flood method of irrigating should never be used. The crop should not suffer for water or be burdened with excessive amounts of it, but the soil should be kept in such condition as to be conducive to good crop growth at all times. Care in blocking, thinning, and cultivating are important, as carelessness in performing these operations results in the destruction of many young beet plants. Delayed cultivation also often allows weeds to sap from the soil nourishment that should be going to the growth of the beets.

Many times it is the putting on of a few extra finishing touches that enables a thing to pay a profit instead of a loss. It is often the case in growing beets that the little additional care used in performing the many operations makes the crop yield a profit and not a loss. It is realized that there are many factors over which the farmer has no control that greatly affect his yields. Sometimes, even after all

his efforts to see that everything has been done to insure a large tonnage, something happens that cuts down his yield. It has not been the intent of this

article to censure those so unfortunate as to have low yields, but to offer some suggestions that may be helpful to them in increasing their yields.

DRAINAGE WORKS ON IRRIGATION PROJECTS CONSTRUCTED BY THE UNITED STATES RECLAMATION SERVICE.

By J. L. Burkholder, Drainage Engineer.

DURING the past few years about 12 per cent of the expenditures from the reclamation fund has been for drainage construction. This represents an annual expenditure of approximately \$1,000,000.

Drainage data.—A comparison of various systems on large irrigation projects constructed by the United States Reclamation Service to July 1, 1921.

Project and State.	Drainage system.	Length of completed drains (miles).		Per cent complete.	Distance apart or spacing of drains (miles).		Are drains interceptive or relief?	Topography.			Average depth of drains (feet).	Description of typical soil at grade depths.
		Open.	Closed.		Average maximum.	Average minimum.		Descriptive.	Average slope per mile (feet).	Does topography govern drain location?		
Yuma, Arizona...	Yuma Valley..	24.1	.....	50	1 2½	1 1	Relief.....	River bottom flat.	2½	Partly..	9	Fine sand.
Do.....	Yuma Reservation.	11.7	4	100	.....	.....	do.....	do.....	2½	do.....	9	Do.
Grand Valley, Colorado.	Grand Valley.	13.7	.....	30	1	½	Both.....	Rolling, with shale ridges.	60	Not generally.	8	Mostly shale; some clay and coarse sand.
Boise, Idaho.....	Pioneer and Nampa Meridian. ¹	123	.38	100	1½	¾	Relief.....	Slightly rolling, with valleys.	14	Yes.....	9-10	Coarse sand; sand, and gravel.
Do.....	Riverside. ²	44	.....	100	.8	.6	One-half relief, one-half interceptive.	Level bottom and slightly rolling benches.	10	Partly..	10-11	Gravel, sand, and shale.
Do.....	Fargo.....	7.4	.....	80	1½	.9	Both.....	Rolling, with benches.	40	do.....	9	Sand and gravel.
Minidoka, Idaho..	Minidoka, North Side.	109	.....	100	1½	¾	Relief.....	Flat.....	1	No.....	9	Do.
Flathead, Montana.	Polson. ³	.18	2.97	90	.....	¾	Both.....	Even slope....	50	Yes.....	7	Clay and quicksand.
Huntley, Montana	Huntley.....	16	50.5	75	1½	¾	do.....	Flat with well-defined breaks.	8-10	do.....	8-9	Clay, sand, and gravel.
North Platte, Nebraska-Wyoming.	Interstate Division.	67.59	14.18	100	¾	¾	Relief.....	Rolling.....	15	do.....	8	Fine sand, gravel, and clay.
Carlsbad, New Mexico.	Carlsbad.....	11.13	3.65	96	(*)	(*)	Interceptive.	River valleys and smooth slopes.	12	do.....	9	Gypsum, sand, and gravel.
Rio Grande, New Mexico-Texas.	Mesilla Valley. ⁴	132.8	.....	65	1½	¾	Both.....	Level, cut by old river beds.	4	Partly..	10	Fine sand.
Do.....	El Paso Valley	71.9	.....	66	1½	¾	do.....	do.....	3.8	do.....	10	Do.
Umatilla, Oregon.	Umatilla. ⁶	10	.....	100	½	2½	Relief.....	Rolling, with valleys.	6	Yes.....	5	Sand, gravel, and rock.
Klamath, Oregon.	Klamath.....	98.7	8	90	2	¾	do.....	Fairly level...	3	No.....	7	Hardpan, chalk, and fine sand.
Yakima, Washington.	Sunnyside. ⁷	76.06	78.36	95	1	¾	do.....	Flat to rolling.	5-150	Yes.....	5-23	Varies from rock to quicksand.
Shoshone, Wyoming.	North Garland	12.65	1.6	30	1	¾	Interceptive.	do.....	35	No.....	9	Quicksand, shale, and sand rock.
Do.....	South Garland and West Garland.	23.85	90.60	85	¾	¾	Relief.....	Flat, with benches.	25	do.....	8½	Gravel.
Do.....	Frankie.....	7.95	.....	10	¾	¾	Interceptive.	Rolling.....	40	do.....	9	Quicksand, shale, and sand rock.

¹ Estimated when system is completed.

² All excavation with electric draglines.

³ Tile and wood-box drain.

⁴ Drains all interceptive so that no spacing enters into the consideration.

⁵ System includes bottom lands on both sides of river.

⁶ East Side Division.

⁷ Work not done by United States.

The total sum spent for this feature of irrigation work since the inception of the Reclamation Service in 1902 is, in round figures, \$8,000,000.

The results accomplished to June 30, 1921, by this expenditure are the construction of 889 miles of open drains, 183 miles of closed drains, several pumping installations, and investigation work for the systems built and for those which are needed in the immediate future. The construction work completed is estimated to have reclaimed and protected from seepage about 370,000 acres of irrigable land.

There remains on the various projects a considerable area, estimated at about 125,000 acres, which is damaged to some extent by seepage. In some cases

construction is under way for the relief of this land; in other cases, work has not yet been undertaken, either because seepage conditions are not yet serious enough or because the landowners have not seen fit to guarantee the repayment of the cost thereof.

In addition to the drainage work mentioned above, several projects, notably the Yakima in Washington and the Salt River in Arizona have constructed drainage systems without assistance from the Reclamation Service. On the Sunnyside Division of the Yakima project there have been built 76 miles of open drains and 78 miles of closed drains. The Salt River project is installing an extensive drainage system, consisting principally of unit-operated electrical pumps, which

Drainage data.—A comparison of various systems on large irrigation projects constructed by the United States Reclamation Service to July 1, 1921—Continued.

Project and State.	Drainage system.	Description of typical soil at intermediate depths.	Discharge of drains.			District areas (acres).					Period of construction (years).	Total cost of system.
			Average annual (acre-feet).	Average maximum (second-feet).	Average minimum (second-feet).	Owned by interests paying for drainage.	Gross area covered by drains. ⁸	Area water-logged before drainage. ⁹	Area water-logged July 1, 1921. ⁹	Estimated area protected. ¹⁰		
Yuma, Arizona...	Yuma Valley.	Sandy loam.....	25,000	40	30	50,000	50,000	1,600	1,600	25,000	1916 to date.	\$379,000.00
Do.....	Yuma Reservation.	.....do.....	17,000	35	15	15,000	9,500	1,000	1,000	8,000	1913 to 1915..	¹¹ 146,000.00
Grand Valley, Colorado.	Grand Valley.	Clay, sandy clay and shale.	¹² 280	¹³ 5.9		35,000	4,300	960	140	2,800	1920 and 1921	69,000.00
Boise, Idaho.....	Pioneer and Nampa Meridian. ³	Clay with some hard pan and gravel.	181,575	405	209	100,000	64,000	17,000	800	30,000	1913 to 1917..	598,867.15
Do.....	Riverside. ⁴	Sandy clay.....	35,000	100	40	16,267	14,700	7,000	350	14,000	1918 to 1920..	250,000.00
Do.....	Fargo.....	.....do.....	7,521	20.4	4.9	5,000	3,300	500	800	2,500	1914-15 and 1921.	¹³ 55,640.00
Minidoka, Idaho.	Minidoka, North Side.	Sand.....	80,650	200	40	65,000	30,000	5,570	560	30,000	1911 to 1915..	749,429.74
Flathead, Montana.	Polson. ⁵	Clay.....	1,000	2.5	1.5	.....	1,240	200	640	1,240	1915 to 1917..	54,197.37
Huntley, Montana	Huntley.....	Gumbo, clay, and sand.	⁽¹⁴⁾	⁽¹⁴⁾	⁽¹⁴⁾	20,000	¹⁵ 5,000	1,500	22,000	1912 to 1921..	510,473.74
North Platte, Nebraska-Wyoming.	Interstate Division.	Finesandy loam	178,662	391	117	110,000	8,200	2,600	1,689	6,351	1913 to 1921..	533,184.59
Carlsbad, New Mexico.	Carlsbad.....	Sandy to clay loam.	6,100	17.0	5.9	25,000	5,000	3,100	150	7,000	1915 to 1918..	129,705.87
Rio Grande, New Mexico-Texas.	Mesilla Valley. ⁶	Silt, clay, and sand.	121,959	.....	.....	97,200	61,700	64,000	27,000	61,700	1916 to 1921..	987,820.60
Do.....	El Paso Valley	.....do.....	31,400	53.9	3.2	63,800	38,600	44,300	18,800	38,600	1916 to 1921..	721,238.05
Umatilla, Oregon.	Umatilla. ⁶	Sand and gravel.	30,000	75	30	26,300	350	350	75	1,000	1909 to 1911..	54,812.63
Klamath, Oregon.	Klamath.....	Yakima loam for 4 feet underlain with chalk.	23,000	5	2	42,700	30,700	18,000	2,000	31,700	1912 to 1921..	473,367.26
Yakima, Washington.	Sunnyside. ⁷	Varies from rock to quicksand	⁽¹⁴⁾	⁽¹⁴⁾	⁽¹⁴⁾	49,510	48,400	⁽¹⁴⁾	48,400	1907 to 1921..	1,178,101.00
Shoshone, Wyoming.	North Garland	Sandy clay, shale and sand rock.	⁽¹⁴⁾	1.5 on Nov. 1, 1921.		.....	12,500	4,400	950	4,500	1920-21.....	136,180.57
Do.....	South Garland and West Garland.	Sandy clay and gravel.	39,035	129	14.5	.....	24,000	1,540	786	18,000	1912 to 1921..	776,534.74
Do.....	Frannie.....	Sandy clay, shale, and sand rock.	⁽¹⁴⁾	⁽¹⁴⁾	⁽¹⁴⁾	15,300	200	660	560	1920-21.....	82,670.42

⁸ Area covered by drains is the gross area through which drains are constructed. Areas above the ends of drains or wholly remote from the drains should not be included.

⁹ Area having seepage water on the surface or within 3 feet of it.

¹⁰ Area which was seeped before drainage; also lands which probably would have become seeped had drains not been constructed.

¹¹ Additional work necessary, \$150,000.

¹² Only one discharge measurement made.

¹³ To Sept. 30, 1921.

¹⁴ No data.

¹⁵ Estimated.

raise the ground water and make it again available for irrigation after dilution with relatively pure river water. These pumps are supplemented in some localities by open and closed drains.

The drainage works are located on 17 irrigation projects in 13 Western States, extending from the Canadian to the Mexican borders. These areas embrace almost every conceivable range of topography and soil conditions, from flat low-lying alluvial river bottoms, where portions of the land are frequently below the water surface elevation of the river, to high bench lands and rolling slopes of colluvial and sedimentary soils.

Surface slopes vary from $2\frac{1}{2}$ to 60 feet per mile, and frequently the combination of steep slopes in sections remote from the river with gradual decreasing grades which become very flat near the river renders the problem of maintaining proper outlets difficult.

The most important drainage systems under construction are located on the Rio Grande project, Texas and New Mexico; the Newlands project, Nevada; and the Shoshone project, Wyoming. The drainage works on the Rio Grande project are estimated to cost over \$3,000,000 when completed and the work is approximately 70 per cent complete.

With few exceptions the work is being done by Government forces. This is necessary because of the desirability of making frequent changes in plans as the work proceeds. A further reason for using Government forces on this work is that difficulty has been experienced in securing contractors who have proper equipment for doing the work economically, and because of this fact the Reclamation Service has gradually accumulated a large amount of modern excavating equipment and has also trained a considerable force of men in this work.

The principal machinery utilized is drag-line excavators for open-drain construction and ladder-type trench excavators for closed-drain construction. The drag lines commonly used on drainage vary in weight from 30 to 90 tons and are chiefly of the caterpillar type. During the year 1921 these machines excavated at a unit field cost of 10.3 cents per yard, of which 6.7 cents represented operating cost and 3.6 cents plant and depreciation cost.

Because of the varying conditions existing on the projects, each drainage system has presented its own peculiar problem, and it has been impossible to establish a general rule of procedure for designing and constructing drains. Extensive and detailed investigations are necessary in each case in order to plan an economical and efficient system. Indeed, it is impossible even with the most comprehensive investigation to settle all of the problems of design and construction in advance of the work, because the information secured from actual construction in a given locality may show the desirability of altering plans.

For this reason drainage plans are usually considered tentative and subject to change as the work proceeds. The importance of developing a tentative plan in advance of the work should not be overlooked, however, as the studies necessary to the formulation of such a plan are certain to result in information which would otherwise not be apparent. An orderly development of a drainage study, looking to the best plan which can be made with the available information, is of the utmost importance. Without a carefully developed first plan, no improvement can be made in the final plan.

For the purpose of securing information which would be helpful in the design of new systems, the writer has compiled the information shown in the accompanying table. This is a comparison of various large drainage systems constructed on irrigation projects of the Reclamation Service. It is interesting to note the wide variation of conditions under which drainage has been necessary. The costs do not in all cases cover all of the drainage work done on a project, but only the portion properly chargeable to a constructed drainage unit. It may also be stated that the systems have been universally successful in lowering the ground water and making reclamation possible. The drains have also protected large areas of land which would have become seeped and alkali had no drains been constructed.

Black Canyon Irrigation District Lands Set Record.

Mr. James B. Newport, president of the board of director of the Black Canyon Irrigation District, Boise project, states that about 90 per cent of the land under the Notus Canal is in cultivation and being irrigated.

As water has been available under this canal for only about one year, it is believed that this establishes the best record that has ever been made in the service in rapidity of development and reclamation of land after the water was made available.

An interesting feature of this record is the fact that the contract with the Black Canyon Irrigation District makes the right to 20 years' time for payment of charges conditional upon a certain percentage of each farm unit being reclaimed each year, namely, 20 per cent of the irrigable acreage by June 15 of the year following the year in which public notice was issued that water was available, 40 per cent in the following year, and 60 per cent in the next year.

Evidently this looked too easy to the water users under the Notus Canal, and they proceeded to show what they really could do in putting their land under cultivation. Water users on other projects might take a leaf from their book,

RECLAMATION LAW NOTES.

Wyoming v. Colorado.

ON June 5, 1922, in the case of Wyoming v. Colorado, the United States Supreme Court handed down an opinion, written by Mr. Justice Van Devanter, in which rights to the use of the waters of the Laramie River, an interstate stream, were adjudicated. The holdings of the court upon questions of law are contained in the following quotation from the opinion:

This is an original suit in this court by the State of Wyoming against the State of Colorado and two Colorado corporations to prevent a proposed diversion in Colorado of part of the waters of the Laramie River, an interstate stream. The bill was brought in 1911, the evidence was taken in 1913 and 1914, and the parties put it in condensed and narrative form in 1916 preparatory to the usual printing. The case has been argued at the bar three times. The court directed one reargument because of the novelty and importance of some of the questions involved, and the other because of an intervening succession in the office of Chief Justice. As the United States appeared to have a possible interest in some of the questions, the court also directed that the suit be called to the attention of the Attorney General; and, by the court's leave, a representative of the United States participated in the subsequent hearings.

The Laramie is an innavigable river which has its source in the mountains of northern Colorado, flows northerly 27 miles in that State, crosses into Wyoming, and there flows northerly and northeasterly 150 miles to the North Platte River, of which it is a tributary. Both Colorado and Wyoming are in the arid region where flowing waters are, and long have been, commonly diverted from their natural channels and used in irrigating the soil and making it productive. For many years some of the waters of the Laramie River have been subjected to such diversion and use, part in Colorado and part in Wyoming.

When this suit was brought the two corporate defendants, acting under the authority and permission of Colorado, were proceeding to divert in that State a considerable portion of the waters of the river and to conduct the same into another watershed, lying wholly in Colorado, for use in irrigating lands more than fifty miles distant from the point of diversion. The topography and natural drainage are such that none of the water can return to the stream or ever reach Wyoming.

By the bill Wyoming seeks to prevent this diversion on two grounds: One that, without her sanction, the waters of this interstate stream can not rightfully be taken from its watershed and carried into another where she never can receive any benefit from them; and the other that through many appropriations, made at great cost, which are prior in time and superior in right to the proposed Colorado diversion, Wyoming and her citizens have become and are entitled to use a large portion of the waters of the river in the irrigation of lands in that State, and that the proposed Colorado diversion will not leave in the stream sufficient water to satisfy these prior and superior appropriations, and so will work irreparable prejudice to Wyoming and her citizens,

By the answers Colorado and her codefendants seek to justify and sustain the proposed diversion on three distinct grounds: First, that it is the right of Colorado as a State to dispose as she may choose of any part or all of the waters flowing in the portion of the river within her borders, "regardless of the prejudice that it may work" to Wyoming and her citizens; secondly, that Colorado is entitled to an equitable division of the waters of the river and that the proposed diversion, together with all subsisting appropriations in Colorado, does not exceed her share; and, thirdly, that after the proposed diversion there will be left in the river and its tributaries in Wyoming sufficient water to satisfy all appropriations in that State whose origin was prior in time to the effective inception of the right under which the proposed Colorado diversion is about to be made.

Before taking up the opposing contentions a survey of several matters in the light of which they should be approached and considered is in order.

Both Colorado and Wyoming are along the apex of the Continental Divide and include high mountain ranges where heavy snows fall in winter and melt in late spring and early summer, this being the chief source of water supply. Small streams in the mountains gather the water from the melting snow and conduct it to larger streams below which ultimately pass into surrounding States. The flow in all streams varies greatly in the course of the year, being highest in May, June, and July and relatively very low in other months. There is also a pronounced variation from year to year. To illustrate, the gaging of the Cache la Poudre, a typical stream, for 1912 shows that the total flow for May, June, and July was more than three times that for the nine other months, and the gaging for a period of 30 years shows that the yearly flow varied from 151,636 to 666,466 acre-feet and was in excess of 400,000 acre-feet in each of four years and less than 175,000 acre-feet in each of five years. Both States have vast plains and many valleys of varying elevation where there is not sufficient natural precipitation to moisten the soil and make it productive, but where, when additional water is applied artificially, the soil becomes fruitful, the reward being generous in some areas and moderate in others, just as husbandry is variously rewarded in States where there is greater humidity, such as Massachusetts, Virginia, Ohio, and Tennessee. Both States were Territories long before they were admitted into the Union as States, and while the Territorial condition continued were under the full dominion of the United States. At first the United States owned all the lands in both and it still owns and is offering for disposal millions of acres in each.

Turning to the decisions of the courts of last resort in the two States, we learn that the same doctrine respecting the diversion and use of the waters of natural streams has prevailed in both from the beginning, and that each State attributes much of her development and prosperity to the practical operation of this doctrine. The relevant views of the origin and nature of the doctrine, as shown in these decisions, may be summarized as follows: The common-law rule respecting riparian rights in flowing water never obtained in either State. It always was deemed inapplicable to their situation and climatic conditions.

The earliest settlers gave effect to a different rule, whereby the waters of the streams were regarded as open to appropriation for irrigation, mining, and other beneficial purposes. The diversion from the stream and the application of the water to a beneficial purpose constituted an appropriation, and the appropriator was treated as acquiring a continuing right to divert and use the water to the extent of his appropriation, but not beyond what was reasonably required and actually used. This was deemed a property right and dealt with and respected accordingly. As between different appropriations from the same stream, the one first in time was deemed superior in right, and a completed appropriation was regarded as effective from the time the purpose to make it was definitely formed and actual work thereon was begun, provided the work was carried to completion with reasonable diligence. This doctrine of appropriation, prompted by necessity and formulated by custom, received early legislative recognition in both Territories and was enforced in their courts. When the States were admitted into the Union it received further sanction in their constitutions and statutes and their courts have been uniformly enforcing it. (*Yunker v. Nichols*, 1 Colo. 551; *Schilling v. Rominger*, 4 Colo. 100; *Coffin v. Left Hand Ditch Co.*, 6 Colo. 443; *Thomas v. Guiraud*, 6 Colo. 530; *Strickler v. Colorado Springs*, 16 Colo. 61; *Oppenlander v. Left Hand Ditch Co.*, 18 Colo. 142; *Wyatt v. Larimer and Weld Irrigation Co.*, 18 Colo. 298; *Crippen v. White*, 28 Colo. 298; *Moyer v. Preston*, 6 Wyo. 308; *Farm Investment Co. v. Carpenter*, 9 Wyo. 110; *Willey v. Decker*, 11 Wyo. 496; *Johnston v. Little Horse Creek Irrigating Co.*, 13 Wyo. 208.)

As the United States possessed plenary authority over Colorado and Wyoming while they were Territories and has at all times owned the public lands therein, we turn next to its action.

The act of July 26, 1866 (c. 262, sec. 9, 14 Stat. 251), contained a section providing: "Whenever, by priority or possession, rights to the use of water for mining, agricultural, manufacturing, or other purposes have vested and accrued, and the same are recognized and acknowledged by the local customs, laws, and the decisions of courts, the possessors and owners of such vested rights shall be maintained and protected in the same." The occasion for this provision and its purpose and effect were extensively considered by this court in the cases of *Atchison v. Peterson* (20 Wall. 507) and *Basey v. Gallagher* (20 Wall. 670), the conclusions in both being shown in the following excerpt from the latter, pages 681-682:

In the late case of *Atchison v. Peterson*, we had occasion to consider the respective rights of miners to running waters on the mineral lands of the public domain; and we there held that by the custom which had obtained among miners in the Pacific States and Territories the party who first subjected the water to use and took the necessary steps for that purpose was regarded, except as against the Government, as the source of title in all controversies respecting it; that the doctrines of the common law declaratory of the rights of riparian proprietors were inapplicable, or applicable only to a limited extent, to the necessities of miners, and were inadequate to their protection; that the equality of right recognized by that law among all the proprietors upon the same stream would have been incompatible with any extended division of the water by one proprietor and its conveyance for mining purposes to points from which it could not be restored to the stream; that the Government by its silent acquiescence had assented to and encouraged the occupation of the public lands for mining; and that he who first connected his labor with property thus situated

and open to general exploration did in natural justice acquire a better right to its use and enjoyment than others who had not given such labor; that the miners on the public lands throughout the Pacific States and Territories, by their customs, usages, and regulations, had recognized the inherent justice of this principle, and the principle itself was at an early period recognized by legislation and enforced by the courts in those States and Territories, and was finally approved by the legislation of Congress in 1866. The views there expressed and the rulings made are equally applicable to the use of water on the public lands for purposes of irrigation. No distinction is made in those States and Territories by the custom of miners or settlers, or by the courts, in the rights of the first appropriator from the use made of the water, if the use be a beneficial one.

And on the same subject it was further said, in *Broder v. Water Co.* (101 U. S. 274, 276):

It is the established doctrine of this court that rights of miners who had taken possession of mines and worked and developed them and the rights of persons who had constructed canals and ditches to be used in mining operations and for purposes of agricultural irrigation, in the region where such artificial use of the water was an absolute necessity, are rights which the Government had, by its conduct, recognized and encouraged and was bound to protect before the passage of the act of 1866. We are of opinion that the section of the act which we have quoted was rather a voluntary recognition of a preexisting right of possession, constituting a valid claim of its continued use, than the establishment of a new one.

The act of July 9, 1870 (c. 235, sec. 17, 16 Stat. 217), provided that "all patents granted, or preemption or homesteads allowed, shall be subject to any vested and accrued water rights" acquired under or recognized by the provision of 1866. These provisions are now sections 2339 and 2340 of the Revised Statutes.

The act of March 3, 1877 (c. 107, sec. 1, 19 Stat. 377), providing for the sale of desert lands in tracts of one section each to persons undertaking and effecting their reclamation, contained a proviso declaring that "the right to the use of water by the person so conducting the same on or to any tract of desert land of 640 acres shall depend upon bona fide prior appropriation; and such right shall not exceed the amount of water actually appropriated, and necessarily used for the purpose of irrigation and reclamation; and all surplus water over and above such actual appropriation and use, together with the water of all lakes, rivers and other sources of water supply upon the public lands, and not navigable, shall remain and be held free for the appropriation and use of the public for irrigation, mining, and manufacturing purposes subject to existing rights." Colorado was not at first included in this act, but was brought in by an amendatory act. Next came the act of March 3, 1891 (c. 561, sec. 18, 26 Stat. 1095), granting rights of way through the public lands and reservations for canals and ditches to be used for irrigation purposes, and containing a proviso saying, "the privilege herein granted shall not be construed to interfere with the control of water for irrigation and other purposes under authority of the respective States or Territories."

Of the legislation thus far recited it was said, in *United States v. Rio Grande Irrigation Co.* (174 U. S. 690, 706): "Obviously by these acts, so far as they extended, Congress recognized and assented to the appropriation of water in contravention of the common-law rule as to continuous flow"; and again, "the obvious purpose of Congress was to give its assent, so far as the public lands were concerned, to any system, although in contravention to the common-law

rule, which permitted the appropriation of those waters for legitimate industries."

June 17, 1902 (c. 1093, 32 Stat. 388), the national reclamation act was passed, under which the United States entered upon the construction of extensive irrigation works to be used in the reclamation of large bodies of arid public lands in the Western States. Its eighth section declared: "Nothing in this act shall be construed as affecting or intended to affect or to in any way interfere with the laws of any State or Territory relating to the control, appropriation, use, or distribution of water used in irrigation, or any vested right acquired thereunder, and the Secretary of the Interior, in carrying out the provisions of this act, shall proceed in conformity with such laws, and *nothing herein shall in any way affect any right of any State or of the Federal Government or of any landowner, appropriator, or user of water in, to, or from any interstate stream or the waters thereof: Provided, That the right to the use of water acquired under the provisions of this act shall be appurtenant to the land irrigated, and beneficial use shall be the basis, the measure, and the limit of the right.*" The words which we have italicized constitute the only instance, so far as we are advised, in which the legislation of Congress relating to the appropriation of water in the arid-land region has contained any distinct mention of interstate streams. The explanation of this exceptional mention is to be found in the pendency in this court at that time of the case of *Kansas v. Colorado*, wherein the relative rights of the two States, the United States, certain Kansas riparians, and certain Colorado appropriators and users in and to the waters of the Arkansas River, an interstate stream, were thought to be involved. Congress was solicitous that all questions respecting interstate streams thought to be involved in that litigation should be left to judicial determination unaffected by the act—in other words, that the matter be left just as it was before. The words aptly reflect that purpose.

The decision in *Kansas v. Colorado* (206 U. S. 46) was a pioneer in its field. On some of the questions presented it was intended to be and is comprehensive, and on others it was intended to be within narrower limits, the court saying, "the views expressed in this opinion are to be confined to a case in which the facts and the local law of the two States are as here disclosed." On full consideration it was broadly determined that a controversy between two States over the diversion and use of waters of a stream passing from one to the other "makes a matter for investigation and determination by this court" in the exercise of its original jurisdiction, and also that the upper State on such a stream does not have such ownership or control of the waters flowing therein as entitles her to divert and use them regardless of any injury or prejudice to the rights of the lower State in the stream. And, on consideration of the particular facts disclosed and the local law of the two States, it was determined that Colorado was not taking more than what under the circumstances would be her share under an equitable apportionment.

As respects the scope and interpretation of the ultimate conclusion in that case, it should be observed, first, that the court was there concerned, as it said, with a controversy between two States, "one recognizing generally the common-law rule of riparian rights," and the other the doctrine of appropriation; secondly, that the diversion complained of was not to a watershed from which none of the water could find its way into the complaining State, but quite to

the contrary; and, thirdly, that what the complaining State was seeking was not to prevent a proposed diversion for the benefit of lands as yet unreclaimed, but to interfere with a diversion which had been practiced for years and under which many thousands of acres of unoccupied and barren lands had been reclaimed and made productive. In these circumstances, and after observing that the diminution in the flow of the river had resulted in "perceptible injury" to portions of the valley in Kansas, but in "little, if any, detriment" to the great body of the valley, the court said, "it would seem equality of right and equity between the two States forbids any interference with the present withdrawal of water in Colorado for purposes of irrigation"; and that if the depletion of the waters by Colorado should be increased the time would come when Kansas might "rightfully call for relief against the action of Colorado, its corporations and citizens, in appropriating the waters of the Arkansas for irrigation purposes." What was there said about "equality of right" refers, as the opinion shows (p. 97), not to an equal division of the water but to the equal level or plane on which all the States stand, in point of power and right, under our constitutional system.

Like that case, the one now before us presents a controversy over the waters of an interstate stream. But here the controversy is between States in both of which the doctrine of appropriation has prevailed from the time of the first settlements, always has been applied in the same way, and has been recognized and sanctioned by the United States, the owner of the public lands. Here the complaining State is not seeking to impose a policy of her choosing on the other State but to have the common policy which each enforces within her limits applied in determining their relative rights in the interstate stream. Nor is the United States seeking to impose a policy of its choosing on either State. All that it has done has been to recognize and give its sanction to the policy which each has adopted. Whether its public-land holdings would enable it to go further we need not consider. And here the complaining State is not seeking to interfere with a diversion which has long been practiced and under which much reclamation has been effected but to prevent a proposed diversion for the benefit of lands as yet unreclaimed.

With this understanding of the case in hand and of some of the matters in the light of which it should be considered, we take up the several contentions, before noticed, which are pressed on our attention.

The contention of Colorado that she as a State rightfully may divert and use, as she may choose, the waters flowing within her boundaries in this interstate stream, regardless of any prejudice that this may work to others having rights in the stream below her boundary, can not be maintained. The river throughout its course in both States is but a single stream wherein each State has an interest which should be respected by the other. A like contention was set up by Colorado in her answer in *Kansas v. Colorado* and was adjudged untenable. Further consideration satisfies us that the ruling was right. It has support in other cases, of which *Rickey Land & Cattle Co. v. Miller and Lux* (218 U. S. 258), *Bean v. Morris* (221 U. S. 485), *Missouri v. Illinois* (180 U. S. 208, and 200 U. S. 496), and *Georgia v. Tennessee Copper Co.* (206 U. S. 230) are examples.

The objection of Wyoming to the proposed diversion on the ground that it is to another watershed, from which she can receive no benefit, is also untenable. The fact that the diversion is to such a watershed

has a bearing in another connection, but does not in itself constitute a ground for condemning it. In neither State does the right of appropriation depend on the place of use being within the same watershed. Diversions from one watershed to another are commonly made in both States and the practice is recognized by the decisions of their courts. (*Coffin v. Left Hand Ditch Co.*, 6 Colo. 443, 449; *Thomas v. Guiraud*, 6 Colo. 530; *Hammond v. Rose*, 11 Colo. 524; *Oppenlander v. Left Hand Ditch Co.*, 18 Colo. 142, 144; *Moyer v. Preston*, 6 Wyo. 308, 321; *Willey v. Decker*, 11 Wyo. 496, 529-531.) And the evidence shows that diversions are made and recognized in both States which in principle are not distinguishable from this; that is, where water is taken in one State from a watershed leading into the other State and conducted into a different watershed leading away from that State, and from which she never can receive any benefit. The principle of such diversions being recognized in both States, its application to this interstate stream does not in itself afford a ground for complaint, unless the practice in both be rejected in determining what, as between them, is reasonable and admissible as to this stream, which we think should not be done.

We are thus brought to the question of the basis on which the relative rights of these States in the waters of this interstate stream should be determined. Should the doctrine of appropriation, which each recognizes and enforces within her borders, be applied? Or is there another basis which is more consonant with right and equity?

The lands in both States are naturally arid and the need for irrigation is the same in one as in the other. The lands were settled under the same public-land laws and their settlement was induced largely by the prevailing right to divert and use water for irrigation, without which the lands were of little value. Many of the lands were acquired under the desert land act, which made reclamation by irrigation a condition to the acquisition. The first settlers located along the stream where water could be diverted and applied at small cost. Others with more means followed and reclaimed lands farther away. Then companies with large capital constructed extensive canals and occasional tunnels whereby water was carried to lands remote from the stream and supplied, for hire, to settlers who were not prepared to engage in such large undertakings. Ultimately the demand for water being in excess of the dependable flow of the streams during the irrigation season, reservoirs were constructed wherein water was impounded when not needed and released when needed, thereby measurably equalizing the natural flow. Such was the course of irrigation development in both States. It began in territorial days, continued without change after statehood, and was the basis for the large respect always shown for water rights. These constituted the foundation of all rural home building and agricultural development, and if they were rejected now the lands would return to their naturally arid condition, the efforts of the settlers and the expenditure of others would go for naught and values mounting into large figures would be lost.

In neither State was the right to appropriate water from this interstate stream denied. On the contrary, it was permitted and recognized in both. The rule was the same on both sides of the line. Some of the appropriations were made as much as 50 years ago and many as much as 25. In the circumstances we have stated, why should not appropriations from this stream be respected as between the two States according to their several priorities, as would be done

if the stream lay wholly within either State? By what principle of right or equity may either State proceed in disregard of prior appropriations in the other?

Colorado answers that this is not a suit between private appropriators. This is true; but it does not follow that their situation and what has been accomplished by them for their respective States can be ignored. As respects Wyoming, the welfare, prosperity, and happiness of the people of the larger part of the Laramie Valley, as also a large portion of the taxable resources of two counties, are dependent on the appropriations in that State. Thus the interests of the State are indissolubly linked with the rights of the appropriators. To the extent of the appropriation and use of the water in Colorado a like situation exists there.

Colorado further answers that she can accomplish more with the water than Wyoming does or can; that she proposes to use it on lands in the Cache la Poudre Valley, and that they, with less water, will produce more than the lands in the portion of the Laramie Valley known as the Laramie Plains. It is true that irrigation in the Poudre Valley has been carried to a higher state of development than elsewhere in the Rocky Mountain region and that the lands of that valley lie at a lower altitude than do those in the Laramie Plains and generally are better adapted to agriculture. In some parts they also require less water. It may be assumed that the lands intended to be reclaimed and irrigated in the Poudre Valley conform to the general standard, although this is left uncertain. But for combined farming and stock raising those of the Laramie Plains offer opportunities and advantages which are well recognized. It is to this use that they chiefly are devoted. It is a recognized and profitable industry, has been carried on there for many years, and is of general economic value. Many of the original ranchmen still are engaged in it—some on the tracts where they first settled. With the aid of irrigation, native hay of a high quality, alfalfa, oats, and other forage are grown for winter feeding, the live stock being grazed most of the year on unirrigated areas and in the neighboring hills and mountains. In this way not only are the irrigated tracts made productive but the utility and value of the grazing areas are greatly enhanced. The same industry is carried on in the same way in sections of Colorado. In both States this is a purpose for which the right to appropriate water may be exercised, and no discrimination is made between it and other farming. Even in this suit Colorado is asserting appropriations of this class for 4,250 acres in the portion of the Laramie Valley in that State, and is claiming under them an amount of water in excess of what she asserts will irrigate a like acreage in the Poudre Valley.

Some of the appropriations from the stream in Wyoming are used for agriculture alone. One of the large projects, dating from territorial days, and constructed at great cost, carries water from the river through a tunnel one-half mile long and canals several miles in length to the Wheatland District, where it is used in irrigating 30,000 acres, all of which are very successfully and profitably farmed in small tracts. This project uses one very large and one comparatively small reservoir for storing water and equalizing the natural flow.

We conclude that Colorado's objections to the doctrine of appropriation as a basis of decision are not well taken and that it furnishes the only basis which is consonant with the principles of right and equity applicable to such a controversy as this is. The

cardinal rule of the doctrine is that priority of appropriation gives superiority of right. Each of these States applies and enforces this rule in her own territory, and it is the one to which intending appropriators naturally would turn for guidance. The principle on which it proceeds is not less applicable to interstate streams and controversies than to others. Both States pronounce the rule just and reasonable as applied to the natural conditions in that region, and to prevent any departure from it the people of both incorporated it into their constitutions. It originated in the customs and usages of the people before either State came into existence, and the courts of both held that their constitutional provisions are to be taken as recognizing the prior usage rather than as creating a new rule. These considerations persuade us that its application to such a controversy as is here presented can not be other than eminently just and equitable to all concerned.

In suits between appropriators from the same stream, but in different States recognizing the doctrine of appropriation, the question whether rights under such appropriations should be judged by the rule of priority has been considered by several courts, State and Federal, and has been uniformly answered in the affirmative. (*Conant v. Deep Creek Irrigation Co.*, 23 Utah, 627, 631; *Willey v. Decker*, 11 Wyo. 496, 534-535; *Taylor v. Hulett*, 15 Idaho, 265, 271; *Howell v. Johnson*, 89 Fed. 556; *Hoge v. Eaton*, 135 Fed. 411; *Morris v. Bean*, 146 Fed. 423; *Bean v. Morris*, 159 Fed. 651.) One of the cases came to this court and the judgment below was affirmed. (*Morris v. Bean*, 221 U. S. 485.) These decisions, although given in suits between individuals, tend strongly to support our conclusion, for they show that by common usage, as also by judicial pronouncement, the rule of priority is regarded in such States as having the same application to a stream flowing from one of them to another that it has to streams wholly within one of them.

Bills Relating to Federal Reclamation.

IN THE HOUSE.

H. J. Res. 354.—"Joint resolution authorizing the Secretary of the Interior to make a reinvestigation of the tricounty project in Nebraska, comprising the counties of Gosper, Phelps, and Kearney, and for other purposes," introduced June 23, 1922, by Representative William E. Andrews, of Nebraska.

H. R. 12188.—"A bill to confer jurisdiction upon the Court of Claims to ascertain the cost to the Southern Pacific Company, a corporation, and the amounts expended by it from December 1, 1906, to November 30, 1907, in closing and controlling the break in the Colorado River," introduced June 26, 1922, by Representative Henry Z. Osborne, of California.

IN THE SENATE.

S. J. Res. 215.—"Joint resolution providing for reinvestigation of the tricounty irrigation project, Nebraska," introduced June 23, 1922, by Senator George W. Norris, of Nebraska.

S. 3709.—"A bill to provide for an examination and report on the condition and feasibility of a reclamation project at Hope, Eddy County, New Mexico," introduced June 14, 1922, by Senator Holm O. Bursum, of New Mexico.

S. 3720.—"A bill for the relief of Stella M. Musselman," introduced June 16, 1922, by Senator Thomas J. Walsh, of Montana.

S. 3745.—"A bill for the creation of the Columbia Basin Irrigation Commission and authorizing an ap-

propriation therefor," introduced June 24, 1922, by Senator Miles Poindexter, of Washington.

S. 3792.—"A bill to provide for the protection and development of the lower Colorado River Basin," introduced July 7, 1922, by Senator Key Pittman, of Nevada.

S. 3794.—"A bill to amend section 35 of the act entitled 'An act to promote the mining of coal, phosphate, oil, oil shale, gas, and sodium on the public domain,'" introduced July 7, 1922, by Senator John B. Kendrick, of Wyoming.

S. 3804.—"A bill granting an extension of time for the repayment of construction charges on reclamation projects," introduced July 10, 1922, by Senator William E. Borah, of Idaho.

S. 3805.—"A bill to confer jurisdiction upon the Court of Claims to ascertain the cost to the Southern Pacific Company, a corporation, and the amounts expended by it from December 1, 1906, to November 30, 1907, in closing and controlling the break in the Colorado River," introduced July 10, 1922, by Senator Samuel M. Shortridge, of California.

S. 3808.—"A bill authorizing the Secretary of the Interior to investigate and report to Congress upon the Columbia Basin Irrigation project," introduced July 10, 1922, by Senator Miles Poindexter, of Washington.

—Ottamar Hamel.

Cultivation versus Irrigation.

As an indication of what cultivation will do in reducing the amount of water ordinarily used in producing a crop, the Montrose (Colo.) Press cites the remarkable results accomplished by Mr. Ed. Faast, of the Uncompahgre project. Mr. Faast recently invited the members of the board of directors of the water users' association and the editors of the local papers to go to his farm and see what could be done toward growing sugar beets without water.

Mr. Faast has 5 acres in beets. The land was plowed last fall, and by spring it was mellow. It was then worked over again and the beet seed planted April 1. No water was put on and there was practically no rain during the spring. The beets came up in fine shape and are as large and strong as other beets which have been irrigated two or three times. At the end of June Mr. Faast had started water running down every other row and was giving the beets their first soaking. Some of the roots were down 15 inches.

As stated by the Press: "This shows that proper cultivation of the soil will work wonders in crop growing, and materially lessen the amount of water needed to mature the crop. Men like Ed. Faast who make these experiments are of the greatest value to a community."

At the end of June new potatoes were being shipped from the King Hill project at 8 to 10 cents per pound. Shipments were in less-than-carload lots, by express.

IRRIGATION HAS HELPED MATERIALLY IN PRODUCING THESE RESULTS.

Grand Valley Project, Colorado.

BECAUSE of the fact that this project is adjacent to an old irrigated section, which is also tributary to the towns in this valley, it is impossible to segregate some of the matter which has been furnished by other projects. For this reason also the statistics as given for banks, towns, etc., include figures which apply to the old projects as well as to the Grand Valley project.

Values.

Value of improved farm lands with improvement on project, estimated by owners at close of 1921.....	\$1, 113, 668
Value of live stock.....	155, 323
Value of farm equipment.....	77, 960
Total	1, 346, 951
Value of crops produced in 1921.....	356, 730

Other statistics, 1921.

Number of farms.....	402
Number of towns (near by).....	6
Population of farms.....	1, 064
Population of towns.....	11, 246
Acres supplied with water.....	20, 580
Acres in crop.....	19, 178
Public schools (project, 4; near by, 19).....	23
Newspapers (2 daily, 2 weekly).....	4
Banks (for entire valley).....	7
Capital stock.....	\$465, 000
Deposits.....	\$3, 259, 780
Number of depositors.....	10, 150

Industries:

- 1 sugar factory.
- 2 packing houses.
- 1 flour mill.
- 1 spray-material factory.
- 1 creamery.
- 1 concrete-products plant.
- 2 canning factories.
- 2 brick factories.
- 1 ice plant.

Belle Fourche Project, South Dakota.

Water for irrigation was first delivered to a small area in 1908, and has steadily increased until approximately 82,500 acres are susceptible of irrigation at the present time. From 55,000 to 60,000 acres of this area are being cultivated and watered each year.

Prior to irrigation the country was used as range for cattle.

The following statistics for 1921 show in a general way the development made on the project:

Value of farm lands and improvements.....	\$6, 187, 915
Value of live stock on hand.....	943, 907
Value of farm equipment.....	295, 188
Total	7, 427, 010

Assessed valuations.

Farms and personal property.....	\$6, 147, 813
Towns.....	936, 041
Public utilities.....	59, 300
Total	7, 143, 154

Value of crops.

Value of crops produced in 1921.....	\$513, 749
Value of crops produced, 1912 to 1921, inclusive.....	7, 900, 526

Shipments of agricultural products from project towns, 1921.

	Cars.
Cattle.....	105
Hay.....	210
Hogs.....	108
Sheep.....	177
Sugar beets.....	258
Wheat.....	59
Miscellaneous.....	13
Total	930

Wholesale purchases of manufactured goods during 1921.

Dry goods, clothing, and shoes.....	\$72, 882. 95
Groceries.....	150, 637. 30
Lumber.....	26, 502. 00
Automobiles, trucks, etc.....	2, 726. 38
Hardware.....	47, 576. 00
Coal, feed, flour.....	47, 376. 00
Farm implements.....	3, 000. 00
Machinery and supplies.....	150. 00
Drugs and sundries.....	17, 786. 78
Cigars, etc.....	3, 495. 00
Furniture.....	2, 000. 00
Other merchandise.....	49, 046. 90
Grain and mill stuffs.....	65, 531. 75
Total	488, 711. 06

Other statistics.

Number of farms.....	1,033
Number of towns.....	4
Population of towns.....	650
Population of farms.....	2,510
Acres irrigated.....	55,100
Acres in crop.....	55,100
Public schools.....	24
Churches.....	6
Newspapers.....	2
Banks.....	6
Capital stock.....	\$100,000
Deposits.....	\$686,042

Industries.

Flour mill.....	1
Elevators.....	3
Feed yard.....	1

Strawberry Valley Project, Utah.*Estimated valuations, 1921.*

Value of farm lands and improvements on project, estimated by owners at close of 1921.....	\$12,850,000
Value of live stock.....	636,400
Value of farm equipment.....	130,000
Total.....	13,616,400

Assessed valuation.

	1914	1921	Increase.
Farms.....	\$3,345,000	\$8,735,000	\$5,390,000
Towns.....	4,215,000	5,600,000	1,385,000
Public utilities.....	1,560,000	2,200,000	640,000
Total.....	9,120,000	16,535,000	7,415,000

Value of crops produced.

	1914	1921	Increase.
Alfalfa.....	\$300,000	\$500,000	\$200,000
Wheat.....	100,000	270,000	170,000
Sugar beets.....	100,000	600,000	500,000
Small fruits.....	65,000	115,000	50,000
Miscellaneous.....	45,000	72,000	27,000
Total.....	610,000	1,557,000	947,000

Shipments of agricultural products, 1921.

	Cars.
Hay.....	200
Potatoes.....	100
Sugar.....	100
Peaches.....	50
Cherries.....	10
Cattle.....	150
Sheep.....	80
Flour.....	15
Wheat.....	50
Miscellaneous.....	50
Total annual shipments.....	805

Other significant statistics, 1921.

Number of farms.....	3,200
Number of towns.....	12
Population.....	16,000
Churches.....	22
Schools.....	22
Newspapers.....	3
Banks.....	6
Capital stock.....	\$285,000
Depositors.....	10,000
Deposits.....	\$1,750,000
Acres irrigated.....	54,000
Acres cropped.....	50,000

Industries:

3 sugar factories.
2 ice plants.
1 feed mill.
4 flour mills.
1 ore-treatment mill.
2 limestone quarries.
2 railroads, steam.
1 railroad, electric.
2 hydroelectric power plants.

Okanogan Project, Washington.

The history of the Okanogan project is that of a transformation from its original desert state to a prosperous fruit-growing district.

Value of crops produced in 1921.

Fruit (principally apples).....	\$1,996,300
Alfalfa.....	22,900
Potatoes.....	3,400
Miscellaneous.....	28,700

Total..... 2,051,300

Wholesale purchases of manufactures in 1921.

Dry goods, clothing, and shoes.....	\$327,000
Lumber.....	120,000
Automobiles, trucks, etc.....	55,000
Groceries.....	413,000
Hardware.....	150,000
Coal, feed, flour, etc.....	68,000
Farm implements.....	90,000
Machinery supplies.....	23,000
Electrical supplies.....	7,000
Jewelry and miscellaneous instruments.....	15,000
Drugs and sundries.....	45,000
Cigars, etc.....	79,000
Furniture.....	46,000
Other merchandise.....	200,000

Total for 1 year..... 1,638,000

Values created.

Value of farm lands and improvements on project, estimated by the owners at the close of the year 1921.....	\$4,437,800
Value of live stock.....	87,800
Value of farm equipment.....	561,900
Total	5,087,500

Shipments of agricultural products, 1921.

Fruit, cars.....	1,466
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Other significant statistics, 1921.

Number of farms.....	439
Number of towns.....	3
Population.....	3,085
Acres supplied with water.....	5,644
Acres in crop.....	5,322
Public schools.....	3
Churches.....	8
Newspapers.....	3
Banks.....	5
Capital stock.....	\$140,000
Deposits.....	\$1,043,000

Industries:

- 1 concrete-pipe factory.
- 2 sawmills.
- 2 box factories.
- 1 evaporating plant.
- 1 lime and sulphur spray factory.

The total ultimate cost of the project to the land-owners was estimated on December 31, 1921, to be \$1,470,154. The value of crops raised in 1921 alone was \$2,051,300.

Yakima Project, Washington.

	Sunnyside Division.	Tieton Division.
Total acreage for which water is available.....	100,733	32,000
Number of farms.....	3,065	1,340
Owners, including entrymen.....	2,322	1,010
Tenants.....	743	290
Number of towns.....	11	8
Population of farms.....	12,080	3,457
Population of towns.....	6,941	1,000
Average population on farms.....	4	2.7
Acreage irrigated.....	94,500	28,500
Acreage cropped.....	80,676	27,200
Public schools.....	41	10
VALUES.		
Crops, 1921.....	\$7,797,000	\$3,166,410
Average per acre.....	96.65	116.40
Live stock.....	1,668,151	455,152
Equipment.....	916,806	293,866
Automobiles.....	1,082,000	345,109
Silos.....	44,800	13,400
Value of improved lands.....	23,359,750	11,164,445
Improvements.....	16,500,000	1,500,000

Flathead (Indian) Project, Montana.*Values created.*

Value of farm lands and improvements on project, estimated by the owners, at close of 1921.....	\$8,567,823
Value of live stock.....	650,000
Value of farm equipment.....	350,000
Total	9,567,823
Assessed valuation.....	6,173,101
Value of crops produced in 1921.....	2,383,733

Shipments of agricultural products, 1921.

	Cars.
Wheat.....	185
Oats.....	4
Potatoes.....	41
Fruits.....	6
Hay.....	32
Flour.....	92
Cattle and hogs.....	36
Wool.....	2
Total	398
Value of crops and live stock marketed.....	\$1,200,000

Other statistics.

Number of farms.....	2,500
Number of towns.....	11
Population of project.....	8,000
Population of towns.....	4,500
Acres supplied with water.....	30,485
Number of schools.....	34
Number of churches.....	9
Number of newspapers.....	5
Number of banks.....	10
Deposits, 1921.....	\$1,457,645
Value of town property and merchandise.....	\$3,450,000
Miles of railroad.....	40
<i>Industries:</i>	
3 flour mills.	
1 creamery.	
5 lumber mills.	

Reclamation Service Orders.

CIRCULAR LETTERS.

- No.
- 1129. Classification of objects of expenditure.
 - 1130. Revised form of application for refund of retirement deductions.
 - 1131. Financial statement, Form 7-826.
 - 1132. Regulations under the relief act of March 31, 1922. (See C. L.'s 1100 and 1120.)
 - 1133. Preparation of copy for farm-unit plats for reproduction.
 - 1134. Hire of commercial motor vehicles.
 - 1135. Economies, Flathead project.

ADMINISTRATIVE AND STATISTICAL PROGRESS REPORTS FOR JUNE, 1922.

Monthly conditions of principal Reclamation Service reservoirs for June, 1922.

[Elevation above sea level.]

State and project.	Reservoir.	Available capacity in acre-feet.	Elevation.		Storage in acre-feet.			Out-flow in acre-feet.	Elevation of water surface.		
			Spill-way crest. ¹	Lowest gate sill. ²	Begin-ning of month.	End of month.	Maxi-mum.		Begin-ning of month.	End of month.	Maxi-mum.
Arizona, Salt River.....	Roosevelt ³	1,305,000	2128.1	1924.6	973,932	877,388	973,932	.....	2124.25	2117.31	2124.25
California, Orland.....	East Park.....	51,000	1199.68	1111.68	51,030	46,660	31,030	4,000	1199.7	1197.27	1199.7
Idaho:											
Boise.....	Arrowrock.....	280,000	3211	2964.5	273,800	277,700	282,860	615,126	3210.1	3211.4	3213.12
	Deer Flat.....	177,000	2518	2488	141,300	104,771	141,300	53,850	2514.2	2509.6	2514.2
	Lake Wolcott.....	95,180	4245	4236	92,740	107,240	107,790	848,525	4244.79	4246	4246.2
	Jackson Lake.....	847,000	6769	6728	537,510	847,000	847,000	75,098	6756.33	6769	6769
Montana:											
Milk River.....	Nelson.....	38,500	2216	2200	35,640	31,300	35,640	2,617	2215.21	2213.94	2215.21
St. Mary storage.....	Sherburne.....	66,000	4788	4720	5,030	15,270	15,270	.....	4734.5	4747.7	4747.7
Sun River.....	Willow Creek.....	16,700	4130	4085	11,545	13,355	13,355	.....	4124.5	4126.5	4126.5
Nebraska-Wyoming, North Platte.	Pathfinder.....	1,070,000	5852	5670	879,510	934,430	972,850	300,150	5842.88	5845.68	5847.55
	Lake Alice.....	11,400	4182	4159	7,959	7,569	7,959	.....	4177.2	4176.6	4177.2
	Lake Miniatore.....	60,760	4125	4074	60,983	43,988	60,983	.....	4125.1	4116.7	4125.1
Nevada, Newlands.....	Lake Tahoe.....	120,000	6230	6224	.....	.....	.....	.....	6226.19	6227.16	6227.16
	Lahontan.....	273,600	4162	4060	273,600	273,600	273,600	.....	4163	4162.7	4163.5
New Mexico:											
Carlsbad.....	McMillan.....	45,000	3267.7	3241.6	22,500	28,500	33,500	20,000	3263.1	3264.6	3266.6
Rio Grande.....	Elephant Butte.....	2,638,000	4407	4231.5	1,835,906	1,993,612	1,993,612	144,472	4384.5	4389.5	4389.5
Oregon, Umatilla.....	Cold Springs.....	50,000	621.5	560	49,550	43,400	49,700	12,114	620.29	617.05	621.28
Oregon-California, Klamath.	Clear Lake.....	462,000	4540	4514	433,800	417,000	433,000	.....	4038.93	4038.3	4038.93
South Dakota, Belle Fourche	Belle Fourche.....	203,000	2975	2920	154,100	144,340	154,100	22,785	2968.3	2966.9	2968.3
Utah, Strawberry Valley....	Strawberry.....	250,000	7558	7517	250,000	250,000	250,000	34,825	7560.3	7558.5	7560.5
Washington:											
Okanogan.....	Conconully.....	14,400	2290	2232	3,767	8,295	8,670	4,440	2261.9	2275.5	2276.5
Yakima.....	Bumping Lake.....	34,000	3426	3389	22,675	38,395	38,395	.....	3416.8	3429.5	3429.5
	Lake Cle Elum.....	20,800	2134	2122	30,210	27,100	31,850	4,750	2136.6	2135.3	2137.3
	Lake Kachess.....	210,000	2258	2192	218,690	234,775	234,775	.....	2257.4	2261	2261
	Lake Keechelus.....	152,000	2515	2425	146,550	153,755	153,955	200	2512.5	2515.4	2515.5
Wyoming, Shoshone.....	Shoshone.....	456,600	5360	5132.3	466,690	470,083	480,352	383,922	5361.5	5362	5363.5

¹ Or maximum storage.² Or zero storage.³ Zero water depth at elevation 1902.2.⁴ Amount of silt shown by silt survey deducted from original capacity.⁵ Proposed regulation.⁶ Estimated low-water limit under proposed plan of regulation.⁷ Elevation of reservoir raised 12 inches by stop logs in spillway.

SALT RIVER PROJECT, ARIZONA.

Water was run in all of the canals during June. The demand for irrigation-water service was very heavy.

Five regular crews were in the field and the following maintenance work was accomplished: 54½ miles main canal cleaned; 154½ miles laterals cleaned; 131 old structures repaired; 2,876 linear feet riprap placed; 2 cubic yards concrete placed; 93½ cubic yards earth excavated; 346 cubic yards earth embankment placed.

A demossing crew with 5 men and 16 mules demossed a total of 80 miles of canal from Lateral 2½ to 14 on Eastern Canal and Lateral 3 to 17 on Consolidated Canal.

The *Ruth* dredger bermed 7,500 cubic yards from Grand Canal.

The *P. & H.* drag line removed 7,000 cubic yards of silt from the Western Canal.

The following construction work was accomplished: 80 new structures were installed; 92 cubic yards concrete placed; 78 feet 30-inch concrete pipe placed; 1,941 feet 24-inch concrete pipe placed; 158 feet 24-inch corrugated-iron pipe placed; 18 feet 12-inch vitrified tile placed; 4½ miles new waste ditch completed; 1 mile new irrigation ditch completed; 12,526 cubic yards earth excavated.

The pump-house construction crew accomplished the following work: Completed pump house 12 E-8½ N; completed pump house 13 E-8½ N; completed 20 by 6 foot barge for the *Ruth*; completed 16 by 4 foot boat for use of engineers on the Eastern Canal; completed hay shed for the association warehouse; installed two concrete head walls; installed one 24-foot by 24-inch concrete culvert.

The *Monighan* drag line and the *Lidgerwood* excavated 18,411 cubic yards.

The Roosevelt power plant operated 707.42 hours during the month, generating 7,187,000 kilowatt hours with a maximum load of 11,600 kilowatts, an average load of 10,165 kilowatts, and a monthly load factor of 87.7 per cent. The plant was shut down 12.58 hours on June 25 owing to failure of lead-covered cables in the switch-room cave, which involved the cables of all transformer banks. The failure was evidently caused by surges due to lightning, as a severe electrical storm in the immediate vicinity occurred a short time previously.

The Cross Cut power plant operated continuously during the month. Power generated, 1,131,900 kilowatt hours; maximum load, 2,540 kilowatts; average load, 1,572 kilowatts; monthly load factor, 61.9 per cent.

The South Consolidated power plant operated 99.7 per cent of the month, being shut down only when

water was out of the canal when sluicing at Granite Reef Dam. Power generated, 416,800 kilowatt hours; maximum load, 900 kilowatts; average load, 581 kilowatts; monthly load factor, 64.5 per cent.

The Arizona Falls power plant operated continuously during the month. Power generated, 396,100 kilowatt hours; maximum load, 675 kilowatts; average load, 513 kilowatts; monthly load factor, 76 per cent.

The Chandler power plant operated 89.4 per cent of the time during the month. Power generated, 162,370 kilowatt hours; maximum load, 290 kilowatts; average load, 252 kilowatts; monthly load factor, 87 per cent.

New drainage pumping plants.—The test pump was installed and removed from 12 E-8½ N.

The installation of all pumps north of Tolleson was completed and all plants placed in service.

Transmission-line tower guying.—Anchor holes were dug and anchors set on Miami line to tower No. 185. The work on this line is about 80 per cent complete.

Roosevelt power-plant construction.—All reactors for small units are in place ready for connection into the main generator leads.—C. C. Cragin.

YUMA PROJECT, ARIZONA-CALIFORNIA.

June weather was favorable for crops. The price of cotton rose during the month and at the end of the month was 21 to 23 cents. Prospects for this year's crop are excellent.

On the Valley Division, Ruth dredges 7, 8, and 9 cleaned 15½ miles of laterals, excavating 22,400 cubic yards of silt. On the Reservation Division, Ruth dredge No. 6 cleaned 5½ miles of lateral, excavating 7,600 cubic yards of silt. The 30-B Bucyrus began work cleaning the Main Drain on the 24th, and at the end of the month had completed 2,200 linear feet.—Porter J. Preston.

MESA DIVISION.

The 16-inch Krogh pump was operated 382 hours with a delivery of 580 acre-feet of water. The leveling of units and the planting of cover crops is being carried on by the unit holders.

Five thousand two hundred and eighty-four linear feet of lock-joint pipe were placed in the trench and sealed. A number of concrete basin turnouts were built and gates installed.—Porter J. Preston.

ORLAND PROJECT, CALIFORNIA.

The temperature during the early part of June was cool but the remainder of the month was very warm.

Harvesting of the second crop of alfalfa was completed during the month, a large proportion of which was disposed of by the Orland alfalfa-meal mill. Deliveries to the mill during the month amounted to 1,000 tons. Owing to infestation by grasshoppers in certain districts of the project, the growth of the third crop of alfalfa was considerably retarded. The first of the season's apricots ripened shortly after the middle of the month.

Maintenance work consisted of mowing and burning weeds on canal and lateral rights of way and removal of water grass from the South Canal. Cleaning of that section of the South Canal below the head gates with the half-yard clamshell excavator was completed. Draft on storage at East Park was begun on the 17th and at the close of the month a discharge of 235 second-feet was maintained. Water

deliveries amounting to 8,700 acre-feet were made to approximately 14,900 acres which were irrigated.

Diamond drilling at Millsite was continued throughout the month. Office work consisted of platting of field notes on the reservoir topographic survey.—R. C. E. Weber.

GRAND VALLEY PROJECT, COLORADO.

The weather during June was hot and extremely dry until the 28th, when rains fell over most of the project. All crops made an excellent growth and prospects were never better. The first cutting of alfalfa was harvested, producing a good yield of excellent quality. An organized campaign against the grasshopper pest was undertaken under the direction of the county agent, the county and the water users' association cooperating in the purchase of poison. Fair results were being secured in controlling the pest by use of poisoned bran and little damage to crops had resulted.

On account of the long-continued drought, the demand for irrigation water was heavy and the system was in continuous operation, delivering 10,000 acre-feet to project lands and 6,000 acre-feet to the two irrigation districts. The Colorado River reached its peak discharge for the season of 31,000 second-feet on May 29, which was much less than had been expected.

Drainage construction was continued with two drag-line excavators, which completed 2,900 linear feet of open drain, involving 16,000 cubic yards of excavation.

The confirmation proceedings for the authorization of the contract with the Orchard Mesa Irrigation District were approved by the director and the contract held to be in effect. The district officials were engaged in assembling the outstanding bonds and warrants preparatory to liquidating the indebtedness under the terms of the contract.—S. O. Harper.

UNCOMPAHGRE PROJECT, COLORADO.

Work was continued on the excavation and installation of structures on several of the small laterals that have been taken over for operation by the service.

The uncollected water rentals for the year 1921 at the end of June amounted to approximately \$5,580, \$2,100 being collected during the month. Total cash collections to June 30 on account of water rentals for the season 1922 amounted to \$41,622.24.

The anticipated flood conditions of the Uncompahgre River did not materialize. As a consequence it was necessary during the entire month to maintain more or less flow through the Gunnison Tunnel in order to meet the demand for irrigation water and properly regulate the Uncompahgre River.

The bench flume at M. P. 6.70 on the Montrose and Delta main line was completed on June 3, and since that time the canal has been operating under a full head except for a shutdown of 24 hours on June 18 in order to permit the removal of the P. & H. drag line from the canal section. The drag line while moving along the canal bank to new work encountered a weak bank section which caused one of the caterpillars to give way, and as a result the machine was precipitated into the canal on its side. The drag line was turned over and skidded out of the canal on June 18 by using a Hercules stump puller.

On June 21 a washout occurred around the approach of the Big Sandy flume on the King Lateral Extension of the Montrose and Delta Canal. This

lateral was shut down for two days in order that necessary earthwork repairs might be made. On June 26 a washout occurred on the McClanahan Lateral of the Ironstone Canal system, caused by a slide on a steep bank section. The lateral was shut down for 3½ days in order to make the necessary earthwork repairs.

On June 28 a leak was discovered in the 26-inch ingot iron pipe leading from Franklin Mesa to High Mesa. The lateral was shut down for 36 hours for necessary repairs. It was found that one of the ingot iron sheets was defective, and a large number of holes were discovered after the siphon had been uncovered. The section of pipe at the point where the defective sheet was placed was under about a 90-foot head, and in order to make the repairs it was necessary to put in nineteen patch bolts, so that the siphon could operate during the balance of the irrigation season. This section of pipe will have to be removed and replaced with a new sheet at the end of the irrigation season.—*L. J. Foster.*

BOISE PROJECT, IDAHO.

The weather during June was very warm.

By the last of the month the demand for farm help could not be fully supplied. This resulted in an advance in the wage scale amounting to 50 cents to \$1 per day.

The first cutting of alfalfa was harvested. A good yield was obtained and the indications were that the price will be much better than during the past two years.

Boise River remained very high until the last week of the month, when the flow decreased at a rapid rate. The total run-off for June was 660,000 acre-feet, or nearly 40 per cent above the mean.

Owing to dry, hot weather, the demand for irrigation water was very heavy. All of the canals were operated to full capacity. Several small breaks occurred in the lateral system. There was no damage to crops or the land and they were soon repaired. Several serious leaks caused by gophers were discovered and repaired without interruption of the water service. The extreme high water during May and the early part of June brought large quantities of coarse sand down the river, which caused considerable trouble by lodging in the upper end of the Main Canal.

Work was continued on the excavation of the Greenleaf and Drew drains on the Wilder Bench. The water table near these drains was falling and the lands were showing a marked improvement.—*J. B. Bond.*

KING HILL PROJECT, IDAHO.

June weather was favorable for construction work and exceptionally good for crop growth.

Construction.—A small force was employed on the gunite wasteway. On July 1 the structure was 50 per cent complete. Labor was hard to get and of poor quality. Railroad construction through the project, together with demand for farm help, made it practically impossible to either obtain or hold men. Two survey parties were in the field on the location of lateral system.

Operation and maintenance.—A maintenance crew of 4 to 6 men was employed cleaning weeds and moss from canals, installing weirs and turnouts, and making repairs to wooden structures. A harrow constructed of eight 20-inch disks was operated the latter part of the month with much success in the removal of moss from the main canal. With the ex-

ception of a few minor breaks, the water service was uninterrupted throughout the month.

All crops were looking first class. Early potatoes went on the market about the middle of the month and the first cutting of alfalfa was harvested by the 25th.—*A. M. Rawn.*

MINIDOKA PROJECT, IDAHO.

Seasonable weather prevailed during the greater part of June and all crops made a good growth. The first cutting of alfalfa was practically finished at the end of the month and all farm work was well advanced.

The South Side pumping stations were operated to capacity during almost the whole month, 42,887 acre-feet of water being pumped at the pumping station No. 1.

The petition, maps, and other papers for the formation of the American Falls Reservoir District were completed. They were filed with the county clerk of Twin Falls County on July 1.

On June 21 Jackson Lake Reservoir was filled to its capacity of 847,000 acre-feet. It is estimated that there will be a spill of some 90,000 acre-feet before it is necessary to turn out stored water from the reservoir.—*Barry Dibble.*

HUNTLEY PROJECT, MONTANA.

June weather was characterized by frequent heavy rains and floods.

A large amount of extra work was occasioned by the loss of two flumes and considerable damage to canals and laterals during the floods on Lost Boy Creek, Sand Creek, Kaiser Creek, Deer Creek, and other parts of the project on June 15 and 16.

Because of the rainy season, no water had been delivered to July 1, and as a result all laterals and ditches had grown full of weeds and grass, which will make the delivery of water very difficult. The peak of the demand will come early after delivery of water is begun.—*A. R. McGinness.*

MILK RIVER PROJECT, MONTANA.

June weather was, in general, favorable for growing crops; however, some of the first cutting of alfalfa was injured by rain.

Contractors on Nelson Reservoir enlargement and three small earthwork contractors made fair progress; five small earthwork and one small structure contractor made good progress.

Excavation of waste-water ditch VW-1-3 was continued by P. & H. drag line No. 121154, averaging 240 cubic yards per shift, and excavation of drainage ditch DN-DI, near Dodson, was begun with P. & H. drag line No. 121162. Two metal flumes, one operation and maintenance bridge, one pipe turnout, a number of wooden measuring devices, and 5 miles of operation and maintenance road were completed.

Canals on the Malta and Glasgow Divisions were operated for delivery of about 1,800 acre-feet of water to about 3,500 acres of land, and on the Chinook Division about 8,500 acre-feet of water was diverted by the three irrigation district canals and the Agency Ditch. The *Ruth* dredger operated two shifts per day, cleaning about 5½ miles of laterals and waste-water ditches near Malta. Riprap was placed at several bridges on the Glasgow and Malta Divisions, and repairs were made to canal and lateral banks and structures.—*Geo. E. Stratton.*

ST. MARY STORAGE.

June weather was favorable for construction and operation and maintenance work.

About 850 linear feet of canal bank were rebuilt at about the fourth mile of the canal, near Kennedy Creek.

The Sherburne Lakes Reservoir gates were closed on the 20th, and at the end of the month 15,270 acre-feet of water were in storage. The St. Mary Canal was operated the entire month, and a total of 17,275 acre-feet was diverted from St. Mary River, and 13,551 acre-feet were delivered to the North Fork of the Milk River.—*R. M. Snell.*

Prevailing crop prices at close of June, 1922.

Project.	Alfalfa hay, per ton.		Barley, per bushel.	Oats, per bushel.	Wheat, per bushel.	Potatoes, per bushel.
	In stack.	Baled at shipping point.				
Salt River.....	\$8.00	\$12.00	\$0.68	\$0.50	\$1.14	\$1.50
Yuma.....	8.00	12.00	.....	.....	.87	.....
Orland.....	8.00	12.00	.55	.....	.99	.....
Grand Valley.....	8.00	12.00	.....	.....	1.00	.....
Uncompahgre.....	7.12	.....	.63	.45	.90	.30
Boise.....	7.00	11.00	.65	.65	.95	.....
King Hill.....	8.00	.....	.....	.51	.....	6.00
Minidoka.....	.....	8.00	.63	.42	.75	.....
Huntley.....	.....	.....	.....	.....	.....	.....
Milk River.....	8.00	.....	.....	.50	1.23	.90
Sun River.....	9.00	16.00	.90	.90	1.23	1.00
Lower Yellowstone.....	10.00	.....	.55	.50	1.32	.60
North Platte.....	.....	.....	.....	.....	.....	.....
Newlands.....	8.00	12.00	.....	.....	.....	.....
Carlsbad.....	.....	9-10	.....	.....	.....	.....
Rio Grande.....	.....	18.50	.....	.....	.....	.....
North Dakota pumping.....	12.00	.....	.40	.43	1.40	1.00
Umatilla.....	7.00	.....	.....	.....	.....	2.25
Klamath.....	10.00	.....	.53	.40	.90	.....
Belle Fourche.....	5.00	8.50	.57	.43	1.10	1.50
Strawberry Valley.....	8.00	10.50	.80	.53	1.00	1.80
Okanogan.....	.....	.....	.....	.....	.....	.....
Yakima.....	.....	9-15	.....	.....	.....	.....
Shoshone.....	.....	.....	.....	.....	.94	1.25
Indian projects:	.....	.....	.....	.....	.....	.....
Blackfeet.....	10.00	.....	.96	.64	1.10	.....
Flathead.....	8.00	.....	.....	.....	1.07	.45
Fort Peck.....	.....	.....	.....	.....	1.20	.....

SUN RIVER PROJECT, MONTANA.

All crops in northern Montana, both irrigated and dry, were in excellent condition until about the last week in June. The rainfall, while rather light, came so that practically all of the moisture stayed in the ground, and the weather has been generally cool. Many of the farmers thought irrigation was not necessary and as a result of the hot weather during the last few days of the month some crops were burned and there was a sharp increase in the demand for water.

On the Fort Shaw Division all irrigated crops were in excellent condition and the water service was good.

On the Greenfields Division water was delivered throughout the entire month, but the demand was not very heavy until toward the end of the month. The maximum quantity at Fairfield was about 300 second-feet. On June 29 a bad break occurred in the concrete-lined section of the Greenfields main canal, which was promptly repaired by constructing a

wooden flume, and the delivery of water was resumed on July 3.

Most of the earthwork contractors on Part 2 of the Greenfields Division, who executed contracts last fall, have completed the work. About 20,000 cubic yards of material were excavated during the month. Contracts have been awarded for the balance of the lateral system, and at the end of the month the contractors were organizing their forces and getting ready to start work early in July.

During the month there were shipped from the project three carloads of wheat from Fort Shaw and three carloads of wheat from Fairfield.—*Geo. O. Sanford.*

LOWER YELLOWSTONE PROJECT, MONTANA-NORTH DAKOTA.

The first part of June was comparatively dry over the entire project, but from the 22d to the end of the month there was considerable precipitation. The weather was unfavorable for harvesting alfalfa, and the first cutting was considerably damaged. On the upper end of the project the weather was favorable for construction and maintenance work; at the lower end Contractor Hilton was considerably delayed in his work, owing to the unusual number of rainy days.

Contractor J. E. Hilton, under contract 864, had completed all but five schedules under his contract, and it was expected that all the work under this contract would be completed by the middle of July. Beauchaine & Klug, under contract 878, had practically completed all structures under Schedule 1 and were making fair progress under their contract. The Thomas Point Pumping Plant was 94.3 per cent completed at the end of the month. It was expected that this plant would be in operation about the 10th of July.

The maintenance organization was engaged the entire month in working on structures and laterals. Practically all of this work was completed at the end of the month and for the remainder of the season the work will be of routine nature and the organization will be materially reduced. The priming of ditches under canal and lateral extensions will be carried on as structures are installed.

Although no new settlers were obtained during the month, the immigration department of the Great Northern Railway was optimistic as to the prospects of securing settlers during the early part of 1923 in the Fairview territory.

All crops of the valley were never in better condition at this time of year, although the first cutting of alfalfa was considerably damaged by the continuous rains.—*L. H. Mitchell.*

NEWLANDS PROJECT, NEVADA.

June weather conditions were favorable for crop growth and harvesting.

The canal and lateral system was in operation continuously during the month delivering water for irrigation purposes.

The Lahontan Dam spillways continued in operation throughout June, reaching a maximum discharge of 2,847 second-feet on June 9, which decreased to 1,503 second-feet on June 30.

Work uncovering and repairing the Lahontan Dam steel penstock to power house was continued.

The five remaining earthwork schedules, contracts for which were awarded in May, were completed.

Government construction forces placed six new minor timber structures in the lateral system and

completed the excavation of Gault Lateral Wasteway.

Drainage work progressed satisfactorily with seven machines at work on the Upper Soda Lake, L. 12, Harmon, CL, Fernley A₁ (McGarr Branch), Piute, and Hazen Drains; 4.57 miles of Fernley Drains were constructed, involving 208,652 cubic yards earthwork excavation.

At a regular meeting of the Truckee Carson Irrigation District board A. A. Towle was elected to fill the unexpired term of Thomas Williamson, resigned.

Engineer E. E. Jones, of the United States Geological Survey, and representing the Secretary of the Interior, visited the project on June 27 to end of month to confer with the project manager in regard to alleged damage to lands by flooding at head of Lahontan Reservoir.

Assistant Engineer E. W. Fritsch received an assignment to the island of Haiti as designing engineer in the office at Port au Prince and left June 27.—*John F. Richardson.*

CARLSBAD PROJECT, NEW MEXICO.

June weather conditions were favorable for the growth of annual crops.

Water was in the canal during the entire month, except for the period from the 11th to the 15th, inclusive, when the water was turned out to allow the sun to kill the moss. A total of 7,500 acre-feet of water was delivered to the farms. During the last half of the month the demand was extremely heavy owing to the necessity for the general irrigation of the cotton crop for the first time, as well as the irrigation for the second crop of alfalfa. Maintenance work consisted of cleaning C and B drains and cutting weeds and grass throughout the lateral system. The growth of grass and weeds was extremely luxuriant during the latter part of the month.

Crops generally were well advanced as compared with former seasons. Exceptionally good growing weather induced rapid development of the cotton crop. A large percentage of the second cutting of alfalfa was harvested at the close of the month. Showers damaged considerable hay throughout the project. The price of fancy alfalfa hay averaged about \$10.50 f. o. b. the project. Number 1 hay was selling for about \$9 at the close of the month.

The crop census completed during the early part of June showed a total area of 22,530 acres in all crops, with an increase of about 1,000 acres over previous year. An additional 1,000 acres had been irrigated, which was likely planted to sorghum head corns during the month of June. There were about 16,000 acres of cotton on the project and outlying farms adjacent to the project. The Federal farm loan bank at Wichita, Kans., had received applications for loans on project lands amounting to \$262,000. The cottonseed-oil mill at Loving, the stock of which is locally owned, completed its season's run on the 20th. Ten cars of crude oil, valued at \$56,000, had been sold. In addition to this, by-products, including 45 cars cottonseed cake, 325 bales of lint, and 545 tons of hulls, were produced. A total of 1,950 tons of seed were milled. The city of Carlsbad, on the 20th, awarded a contract for a new municipal building.—*L. E. Foster.*

RIO GRANDE PROJECT, NEW MEXICO-TEXAS.

In the Mesilla Division drainage construction progressed with the operation of two Bucyrus class 9½

drag lines, working two shifts each, and one Monaghan 2-T drag line, working one shift, constructing 2.4 miles of drain. Two Ruth ditching machines continued on lateral reconstruction and two P. & H. 206 excavators and one Bucyrus class 9½ continued on the construction of new laterals and levees, all working one shift, constructing 2.4 miles of new lateral and reconstructing 6.2 miles of old community ditch. Twenty-four minor structures were installed.

In the El Paso Division one Bucyrus class 9½ excavator and one Bucyrus class 9½, 30-B, proceeded with drainage construction, each working two shifts, excavating 1.3 miles of drain. One Ruth ditching machine continued on the reconstruction of old community ditches, completing 3 miles. Some levee work was accomplished for the protection of constructed features from river overflow. Eighteen new minor structures were installed and concrete lining placed over drain culverts, and concrete inlet and outlet on several flumes were also installed.

Irrigation deliveries were made continuously throughout the month, with the exception of a few days on the Leasburg system when the water was lowered to make repairs at Leasburg Dam.

The wheat harvest was on in full force, and several carload shipments of cabbage have been made.—*L. M. Lawton.*

NORTH DAKOTA PUMPING PROJECT.

Every feature of the project was in readiness for irrigation operations June 1, but owing to late rains in May no water was delivered until June 6. After June 6 water was delivered on demand until the night of June 22, when the second of two unusually heavy rains occurred and all stations were shut down for the remainder of the month.

The power plant was operated for both commercial power and irrigation; 73,100 kilowatt-hours of electrical energy were delivered to the city of Williston, or about 2 per cent less than in the same month of last year. About 140,000 kilowatt-hours of energy were used in the pumping operations. The powerhouse operations were very efficient, with all the machines in use at full or over load practically all of the pumping period.

The weather was favorable throughout the month and project conditions are good.

One thousand four hundred and ninety-three tons of coal were mined, and the cost per ton was less than for any month in the last three years.—*Wm. S. Arthur.*

UMATILLA PROJECT, OREGON.

The highest mean temperature for a period of 15 years for the same month was the outstanding feature for June. The water supply was above normal.

During the month the first crop of alfalfa was harvested. New potatoes were dug and marketed in small quantities. Picking of strawberries, raspberries, and cherries took place to some extent. Irrigation was heavy except during haying. There was little hay movement to market. Some loose hay was delivered to mill at Hermiston.

No serious difficulty was experienced with the supply of labor, although the service could have used several more men to advantage, provided they could have been available without the establishing of a camp.

The feed canal was operated until the 17th, when all the water was turned out with the exception of that quantity required to furnish the Echo mills,

One crew was employed throughout the month on lateral extension work; 1,075 cubic yards of material were excavated; 2,524 linear feet of 16-inch and 2,080 linear feet of 12-inch concrete pipe were laid, and 10 minor structures were built. The pipe-manufacturing crew operated throughout the month, turning out 2,130 linear feet of 16-inch and 3,480 linear feet of 12-inch concrete pipe.—*H. M. Schilling.*

KLAMATH PROJECT, OREGON-CALIFORNIA.

June weather was dry and warm. The demand for water was the heaviest on record. The season in general was several weeks later than usual. The cutting of the first crop of alfalfa hay was begun in a small way during the latter part of the month; the work will not get into full swing until after the Fourth.

In the Tule Lake Division good progress was made in constructing the J Canal, also on the J Lateral system. The J Canal and parallel waste ditch is being constructed by a class 14 Bucyrus drag-line excavator using 2-cubic-yard bucket. On the lateral system most of the material for the banks was being borrowed from a parallel waste ditch. A Monighan model I-T machine, with a 1-cubic-yard bucket was being used. After July 1 a Bucyrus drag-line excavator, with a 1-cubic-yard bucket, will be available for the above work.

At the Langell Diversion Dam camp was erected and most of the preparatory work completed. Work will begin on constructing the dam shortly after July 1. Profiles and maps had been completed for the main west-side canal of the Langell Valley Division. This work will be advertised for bids in the near future. The excavation will amount to about 190,000 cubic yards.—*Herbert D. Newell.*

BELLE FOURCHE PROJECT, SOUTH DAKOTA.

June weather was almost ideal for growing crops, but rains were too frequent for properly curing hay, practically none of which was harvested without some damage.

Crops at the close of the month were probably better on the average than they have ever been at that date in the history of the project. The frequent rains and moderate weather combined to give the best growing conditions without irrigation.

A small amount of water was run in the Johnston Lateral continuously for irrigation, but the demand on the rest of the project was practically nothing.

Wasting from the reservoir was continued throughout the month, but on account of the inflow from Owl Creek the reservoir elevation at the close of the month was only 2.7 feet lower than on May 12, the date of the destructive storm.

The ditch riders were employed on maintenance while no water was run in the canals.

The Baby Ruth was put to work on June 12 and made an average of 1,275 feet per eight-hour shift; total yardage moved was 5,860.—*B. E. Hayden.*

STRAWBERRY VALLEY PROJECT, UTAH.

June weather was favorable for practically all farm crops. Hot winds occurred for several days during the month, which did slight damage to the grain and beet crops. Practically no precipitation fell during June and the demand for irrigation water was heavy. The first cutting of alfalfa was over and the harvesting of the pea and cherry crops had begun.

Strawberry Tunnel was opened for the first time on the 6th, and at the end of the month 9,426 acre-feet of water had been turned out for irrigation purposes.

The wasteway at Strawberry Dam was in continuous operation during June, wasting approximately 24,000 acre-feet of water. Indian Creek spillway was in operation until the 13th, and 1,600 acre-feet of water were wasted.

During June 35,960 acre-feet of water were delivered for irrigation purposes to the several divisions of the project; 26,534 acre-feet of this amount were diverted from the actual flow of the Spanish Fork River.

The power plant was in continuous operation, with no serious interruptions. A total of 83,106 kilowatt-hours were consumed by the several project towns.

Diamond Fork road was opened for travel through cooperative arrangements made with the Forest Service.

Forty-five boat licenses for operation of boats on Strawberry Reservoir were issued during the month.

Silt deposits in the High Line Canal reduced the capacity from 245 to 195 second-feet and seriously interfered with water deliveries to all lands under the High Line Division. The head works of the Spanish Fork East Bench Irrigation & Manufacturing Co.'s canal were washed out on the 10th. Repairs were made and water turned in again on the 14th.—*W. L. Whittemore.*

OKANOGAN PROJECT, WASHINGTON.

June weather was generally about normal. The surplus of water stored during the month amounted to 2,728 acre-feet. There were released for irrigation from Conconully Reservoir 4,440 acre-feet and at the end of the month there were in storage in both reservoirs 8,595 acre-feet. This, with the canals being run at practically 80 per cent capacity, will, with the estimated amount of pumping at Salmon Lake at 4,000 acre-feet, give a total run from date of 80 days.

The concrete lining of canals was finished on June 7, there being lined 2,320 linear feet during the month, which required 87 cubic yards of concrete. The substitution and installation of motors at the Government wells were finished and those plants were started on June 8. The gravity system was run uninterruptedly during the month until June 13, when a break occurred on the upper main lateral near drop No. 2, which interruption lasted five days; approximately 3,000 cubic yards of material were washed out, which filled up the upper main lateral near drop No. 2 and constituted the larger part of the work in preparing the canal for water.—*Calvin Casteel.*

YAKIMA PROJECT, WASHINGTON.

June temperature was above normal and precipitation below normal.

Sunnyside Division.—Operation of the Sunnyside Canal system was continuous, with a maximum diversion of 1,270 second-feet and average of 1,244 second-feet. Demand for water was fairly heavy, especially during the latter half of the month, when the weather was very warm.

Tieton Division.—An average diversion of 311 second-feet from Tieton River was maintained throughout the month, supplemented by an average of 12 second-feet from south fork of Cowiche Creek, which latter was discontinued on the 28th, owing to the low run-off, and diversion from the river was then increased to 320 second-feet, the carrying ca-

capacity of the main canal. Water service was interrupted for about six hours on June 4 by the accidental tripping of spillway No. 4, which resulted in the washing out of 700 linear feet of the large wooden chute from the spillway to the river. Lands in the south half of the division were without water for about three days as the result of a break near Mile 12 on Lateral G on the afternoon of the 18th, caused by a rat hole in the lower bank. The break was repaired on the 19th and 20th and water service resumed on the 21st. Maintenance work consisted of minor repairs on small wooden structures, patching nonreinforced concrete structures and measuring boxes and installing special concrete measuring devices at the expense of individual water users, and replacement of defective concrete pipe with creosoted wood-stave pipe, 8-inch diameter.

Preliminary report on the Roza Division, exclusive of estimate on wasteways, was forwarded to Denver on June 3, the plans and estimates for the wasteways following on the 19th.

A plan for equalization of operation and maintenance charges on the different classes of water rights on the Sunnyside Division was discussed with the board of directors of the Sunnyside Valley Irrigation District on June 6 and report forwarded to chief engineer on June 13. Draft of proposed contract for sale of water supply to Zillah Irrigation District went forward to Denver on June 8.—*J. L. Lytel.*

TIETON DAM.

About 500 men were employed during June.

The core-wall excavation for this season was completed. Excavation will be resumed during the winter months. Core-wall concreting has been continued, 550 cubic yards being placed.

About 100,900 cubic yards of embankment were placed in June. The material is of good quality and gradation for the dam and puddle core.—*W. C. Christopher.*

RIVERTON PROJECT, WYOMING.

Drag line 121322 was employed on the First Division, Wyoming Canal, June 19 to 30, moving 3,260 cubic yards, all of which was sandstone.

On the Second Division of the Wyoming Canal drag line 121474 was operated two shifts, moving 34,851 cubic yards, about 70 per cent of which was sandstone.

On the Wind River Diversion Dam the forms for the headworks, sluiceway, and logway and appurtenances were completed, and 127 cubic yards of concrete were placed late in the month. No work was in progress on the weir, owing to flood conditions.

On the dike at the Diversion Dam drag line 121323 loaded 10,173 cubic yards on wagons for the embankment. Work on this dike was suspended June 5 to 15 on account of high water.

One party was employed on topographic surveys.

The weather was favorable for construction. The roads were in good condition. The flow of Wind River was about normal, and the snow storage at the end of the month was in excess of normal.—*H. D. Comstock.*

SHOSHONE PROJECT, WYOMING.

June was normal. Practically all the precipitation fell on the 14th and was of benefit to growing crops.

The Shoshone River was in flood stage the entire month. The peak was reached on the 22d, somewhat earlier than usual. It was also smaller than usual.

At Shoshone power plant the roof extension and masonry wall north of the power house were completed and work on placing the rock back fill on the roof was begun. Work in connection with the grounds was also practically completed. Drainage work on the Garland and Fraunie Divisions was resumed on a moderate scale. With the completion of the power plant this work is being undertaken with electric drag lines as the equipment is remodeled and assembled. At the close of the month there were en-

Crop report, Okanogan project, Washington, 1921.

Crop.	Area (acres).	Unit of yield.	Yields.		Values.		
			Total.	Average (per acre).	Per unit of yield.	Total.	Per acre.
Alfalfa.....	852	Tons.....	1,910	2.2	\$12.00	\$22,920	\$26.90
Apples.....	4,618	Boxes.....	1,096,234	237.0	1.80	1,973,221	427.29
Corn fodder.....	11	Tons.....	18	1.6	10.00	180	16.36
Small fruit.....	33	Pounds.....	175,792	5,287.0	.06	10,557	318.00
Garden.....	92				166.56	15,240	166.00
Hay.....	106	Tons.....	169	1.6	12.00	2,028	19.13
Pasture.....	182				10.00	1,802	10.00
Peaches.....	14	Pounds.....	55,400	3,820.7	.04	2,216	153.00
Pears.....	65	do.....	366,850	5,622.2	.024	9,171	141.00
Prunes.....	6	do.....	22,400	3,584.0	.05	1,120	179.20
Potatoes.....	19	do.....	167,650	8,709.0	.02	3,350	174.18
Miscellaneous.....	54	do.....			176.09	9,465	176.00
Less duplicated areas.....	722						
Total cropped.....	5,330	Total and average.....				2,051,270	385.00
Nonbearing orchards.....	310						
Young alfalfa.....	10						
Total irrigated.....	5,650	Areas.			Acres.	Farms.	Per cent of project.
		Total irrigable area farms reported.....			6,203	439	.....
		Total irrigated area farms reported.....			5,650	439	.....
		Under water right applications.....			4,475	402	.....
		Under vested rights.....			1,169	37	.....
		Total cropped area farms reported.....			5,330	439	.....

gaged in this work upon the Garland Division a class 9½ gas drag line, a class 9½ electric drag line, and a ½ cubic yard P. & H. gas drag line. On the Frannie Division there were engaged a class 14 gas drag line, a class 9½ electric drag line, and a ½ cubic yard P. & H. gas drag line. Work was also commenced on the assembly of plant for the construction of the Willwood Diversion Dam.

The canal system of the Garland and Frannie Divisions was in operation at nearly full capacity the entire month, except for a few days following the storm of the 14th. The storm taxed the canal and drainage system, but no great amount of damage was done, the principal break being one in Lateral V, which required three days to repair at a cost of \$350.—*J. S. Longwell.*

INDIAN PROJECTS, MONTANA.

BLACKFEET PROJECT.

During June there were no heavy storms, although there were a good many local showers which hindered construction work somewhat, but were favorable for keeping the crops growing.

Construction work was confined to the excavation of about 1 mile of Four Horns Reservoir Outlet Canal and hauling material for two structures on the same canal, all work being done with Indians and Indian teams.

Two divisions of the project were operated, a total of 3,000 acres being irrigated and 1,612 acre-feet delivered to farms. On the 26th a bank settlement occurred in the Two Medicine Canal where it was nearly impossible to repair it by rebuilding the bank and a 188-foot timber flume was constructed. Conditions were favorable for hauling material and securing labor and the flume was constructed and the water turned back in the canal in 2½ days.

The crops on the project were in exceptionally good condition at the end of the month, as there was ample moisture in the ground to start the crops early in the season, and enough to keep them growing fairly well up to the end of June. Most of them at the end of the month needed irrigation and applications for water were coming in rapidly, although up to that time the amount covered by water-rental applications was considerably less than at the same period last year.—*R. M. Snell.*

FLATHEAD PROJECT.

June weather was generally hot and dry.

High water in creeks and in the Flathead River reached the peak about the 11th and dropped off rapidly during the latter part of the month. Water flowed over the spillway at Tabor Reservoir on the 13th.

The contract work on Dry Creek Canal lining was completed June 12 except for about one-half per cent which could not be finished on account of high water in Tabor Reservoir and Dry Creek.

At the Hubbard Dam equipment was ready to begin stripping operations at the end of the month. Repairs on camp buildings were completed and contracts for wood for camp and machine fuel let and partly completed.

Miscellaneous lateral excavation amounting to about 13,400 cubic yards was done during the month by water users working by the day and by contract.

Forces at operation and maintenance camps, in addition to regular maintenance, placed 57 minor structures on lateral systems. Deliveries of water for the month amounted to 13,850 acre-feet with about 15,000 acres irrigated.

The first cutting of alfalfa was harvested with a large yield. Irrigated crops were making rapid growth. Dry-land crops were suffering on account of the hot, dry weather. The strawberry crop on irrigated lands was exceptionally good, both in quantity and quality.

Prospective land buyers from Iowa visited the project during the month.—*C. J. Moody.*

FORT PECK PROJECT.

June weather was favorable for outdoor work.

Big Porcupine Canal, part of the Little Porcupine system, and Poplar B and C Canals were operated. Weeds were burned in the Big Muddy Canal preparatory to turning in water at an early date.

No construction was in progress except back filling of structures on the Big Muddy Division.

Crop prospects were fair, and live stock was in excellent condition.—*S. A. Kerr.*

GENERAL OFFICES.

Washington office.—Director Davis was in charge of the office, except for a few days attending meetings of the American Society of Civil Engineers, in New York City and Portsmouth, N. H. During his absences the office was in charge of Assistant Director Bien and Chief Counsel Hamele as acting director. Assistant Director Bien was away from the office for about two weeks attending a directors' meeting of the American Society of Engineers, at Salt Lake City. While in Utah he conferred with Project Manager Whittmore regarding the question of turning over the operation of the Strawberry Valley project to the water users. Mr. Bien called at the Denver office on June 10.

Statistician Blanchard and Photographer Dame were in the field the entire month securing still and motion pictures of scenes on a number of the projects, in national parks, and on Indian reservations and at schools for the Brazilian Exposition, the work being done without cost to the Reclamation Service.

During the month the director testified before the House Committee on Irrigation on the Swing bill (H. R. 11449) for the construction of Boulder Canyon Reservoir, which was also strongly supported by Secretary Fall and Secretary Hoover.

At noon on June 17 the officials and employees of the Washington office, with several of the officials of the Department of the Interior, held a meeting in the office of Director Davis commemorating the twentieth anniversary of the approval of the reclamation act on June 17, 1902. Following introductory remarks by Director Davis, in which he stated that Secretary Fall was unable to attend, but sent his best wishes, addresses were made by Hon. Edward C. Finney, First Assistant Secretary of the Interior; Hon. Francis M. Goodwin, Assistant Secretary; Hon. Edwin S. Booth, solicitor for the department; F. H. Newell, former Director of the Reclamation Service; F. E. Weymouth, chief engineer; and Morris Bien, assistant director. The history of the service was reviewed from its beginning as a small office in the hydrographic branch of the Geological Survey to its present organization, with offices in Washington, Denver, and throughout the arid States. Mr. Thomas H. Means, formerly project manager of the Newlands project, wired Director Davis as follows: "Best wishes and congratulations your accomplishments on twentieth reclamation day." Mr. W. A. Beard, president of the Sacramento Valley Development Association, sent the following telegram: "On this twen-

tieth anniversary of national reclamation act our board of directors in session extends greetings to the service and its chief, with heartiest congratulations upon success achieved in construction, settlement, and operation of irrigation projects, the results in growth of population, production, and wealth. More strength to your arm."

A number of tables and diagrams were prepared in connection with an article in the June issue of the RECLAMATION RECORD summarizing 20 years of reclamation. It is planned to continue these analytical articles in future issues of the RECORD.

Up to the end of June 1, 1919 applications for relief had been filed by water users under the act of March 31, 1922. On the basis of 33,000 water users on the project of the service, this represents only 3.6 per cent.

A vote was held in the Washington office recently on the question of office hours. Seventy-two employees voted and the vote was equally divided between those in favor of hours from 8 to 3.30 and

those in favor of a return to the former hours of 9 to 4.30.

Action was taken by the Secretary on the following matters, among others, submitted to him:

Reporting favorably, with suggested amendments, on bill H. R. 11449, providing for the protection and development of the Lower Colorado River Basin and for an appropriation of \$70,000,000 from the General Treasury for the construction of the Boulder Canyon Dam and the all-American canal; signed June 14.

Recommending that authority be granted to advise the water users on the Milk River project that if they will organize an irrigation district under the laws of Montana, executing a contract with the United States to repay the construction costs under the plan approved by the department on December 30, 1921, such contract may contain an article providing that no irrigable acre shall be charged with any construction cost additional to that equitably apportioned against it in the first instance, either as a primary

Comparison between operation and maintenance estimates and results, January 1 to June 30, 1922.

Project.	Gross cost.				Net accruals and revenues.				Area for which water is available.
	Estimate for 1922.		Actual cost to June 30.	Amount * over or under.	Estimate for 1922.		Actual returns to June 30.	Amount more or *less than estimate.	
	Total for year.	To June 30.			Total for year.	To June 30.			
UNDER PUBLIC NOTICE.									
Belle Fourche.....	\$70,000	\$27,000	\$30,000	*\$3,300	\$101,153	\$37,000	\$1,000	*\$36,000	\$82,500
Boise.....	290,000	137,000	118,000	19,000	290,000	142,000	¹ 122,000	*20,000	167,300
Carlsbad.....	52,000	25,000	31,500	*6,500	56,625	31,000	24,000	*7,000	25,000
Huntley.....	45,000	23,500	20,700	2,800	46,500	12,500	.....	*12,500	30,000
King Hill.....	35,500	12,200	12,600	*400	² 35,500	12,200	12,600	400	16,900
Klainath.....	55,000	33,700	22,500	11,200	² 55,000	33,700	22,500	*11,200	51,000
Lower Yellowstone.....	36,000	19,000	11,000	8,000	² 36,000	19,000	11,000	*8,000	40,200
Minidoka (South Side).....	94,000	44,000	35,000	9,000	95,300	24,500	29,000	4,500	49,000
Newlands.....	105,000	56,500	70,500	*14,000	121,000	59,000	70,000	11,000	72,200
North Dakota pumping.....	35,000	15,600	14,000	1,600	² 30,820	10,400	¹ 10,400	.....	7,650
North Platte (Interstate).....	165,000	100,000	95,000	5,000	166,700	39,000	59,000	20,000	² 130,000
Okanogan.....	37,000	20,000	20,000	.....	² 53,720	36,720	36,720	.....	8,460
Orland.....	35,000	19,000	14,500	4,500	35,230	17,500	17,500	.....	20,500
Rio Grande.....	231,000	144,000	135,000	9,000	² 233,945	146,945	137,945	*9,000	116,000
Shoshone.....	70,000	31,800	31,600	800	75,750	29,000	19,000	*10,000	71,100
Strawberry Valley.....	⁴ 25,000	12,400	12,200	200	⁵ 52,500	9,200	9,500	300	59,100
Sun River (Fort Shaw).....	14,000	11,100	7,500	3,600	15,600	5,700	5,400	*300	13,900
Unatilla.....	37,280	18,500	18,000	500	² 37,280	18,500	18,000	\$500	24,400
Yakima:									
Sunnyside.....	130,000	63,500	65,500	*2,000	148,776	72,000	74,000	2,000	103,000
Tieton.....	84,000	42,000	44,000	*2,000	89,800	35,000	30,000	*5,000	32,000
Yuma.....	260,000	130,000	140,000	*10,000	262,000	136,000	126,000	*10,000	63,200
Total.....	1,905,780	985,800	948,500	37,300	2,039,199	926,865	835,565	*91,300	1,183,410
UNDER WATER RENTAL.									
Grand Valley.....	50,000	27,300	23,300	4,000	50,800	22,000	22,700	700	38,400
Milk River (including St. Mary).....	71,500	35,200	26,300	8,900	22,000	14,200	10,500	*3,700	⁶ 74,000
North Platte (Fort Laramie).....	70,000	34,500	29,000	5,500	53,000	12,000	13,000	1,000	43,400
Sun River (Greenfields and Big Coulee).....	25,000	14,900	9,200	5,700	30,000	10,000	10,000	.....	28,500
Uncompahgre.....	135,000	70,000	85,000	*15,000	142,500	48,000	41,500	*6,500	100,000
Total.....	351,500	181,900	172,800	9,100	298,300	106,200	97,700	*8,500	284,300
INDIAN.									
Blackfeet.....	30,000	14,000	9,200	4,800	19,700	8,000	2,200	*5,800	21,500
Flathead.....	65,000	27,000	23,000	4,000	58,000	22,000	12,500	*9,500	105,000
Fort Peck.....	14,600	7,500	7,500	.....	1,000	300	300	.....	22,400
Total.....	109,600	48,500	39,700	8,800	78,700	30,300	15,000	*15,300	148,900

¹ Estimated by Denver office. Figure not shown on project chart.

² Returns regulated by district contract.

³ Includes 17,000 acres for which water is carried in Main Canal.

⁴ Not including tunnel repairs.

⁵ Includes installment of \$25,000 for tunnel repairs.

⁶ Stored water is furnished through the St. Mary Canal for 21,600 acres additional.

construction charge or as a supplemental construction charge; approved June 27.

Recommending approval of public notice announcing a supplemental construction charge of \$30 per acre for drainage purposes on the Frannie Division, Shoshone project; approved June 3.

Recommending approval of a draft of contract, as to form, providing for the construction of additional irrigation, drainage, and flood-protection works in El Paso County Water Improvement District No. 1, Rio Grande project, at an estimated cost of \$1,165,000; approved June 8.

Recommending approval of plan and form of contract providing for the construction of a transmission line from the Shoshone power plant to Greybull and Basin, Wyo., to supply the Standard Oil Co. refineries and the town of Basin with power, at an estimated cost of \$130,000, the funds to be advanced by the oil company and the town, and to be repaid by rebating to them monthly 50 per cent of the payments for power; approved June 20.

Recommending that an allotment of \$600,000 from the appropriation for the Boise project be authorized for the construction of Black Canyon Dam; approved June 26.

Reporting favorably on bill S. 3745, providing for a commission to examine and report on the Columbia Basin irrigation project; signed July 3.

Recommending approval of the allotment of \$100,000 for secondary project investigation; approved July 3.

Among the visitors to the Washington office during the month were John N. Store, civil engineer of Christiania, Norway, in connection with a new system for depositing concrete under water and also a water-filled canvas-hose cofferdam; and C. C. Cragin, general superintendent and chief engineer of the Salt River Valley Water Users' Association.

During the month 95 purchase orders were placed, 8 advertisements were issued, and 66 referred to the General Supply Committee. Purchases amounted to \$3,802.14. The storehouse filled 212 requisitions and made 26 sales from stock, the total value amounting to \$2,553.76.

Publications issued during the month comprised 31 copies of the annual report and 327 miscellaneous publications. The 27 mimeograph jobs amounted to a total run of 5,710 sheets.

The settlement and information section answered 426 inquiries concerning the service and opportunities on the projects. At the end of the month the total number of inquiries from ex-service men concerning opportunities on the land amounted to 193,603.

The photographic laboratory turned out work during the month to the value of \$155.20, distributed as follows: Washington office, \$118.95; field, \$11.60; sales, \$24.65.

Denver office.—Chief Engineer Weymouth and Designing Engineer Savage returned to Denver from their Porto Rico trip on June 19. The chief engineer left again on June 22 for Salt Lake City, where he presented a paper at the meeting of the American Association for the Advancement of Science, returning on June 25. Assistant Chief Engineer Walter visited the Grand Valley, Uncompahgre, and Strawberry Valley projects, and the Salt Lake Basin investigations, as well as lower White River Valley. He returned to Denver on June 16. Assistant Chief Engineer Williams and Engineer Munn were selected as members of a board of engineers to consider Baker project matters and left for Baker, Oreg., on June 25. Mr. Munn also visited the Riverton and Shoshone projects.

The principal work in the designing section during the month consisted of the following: Began studies of river-diversion problems at Black Canyon and Boulder Canyon dam sites, Colorado River; made studies and prepared reports on advisability of changing slopes and top width of Tieton Dam; completed original designs for some of the structures on the J Canal and checked for approval a revised design for lateral and farm turnouts for the same construction work; prepared specifications and drawings for construction of wooden structures; partially prepared designs for turnout through east end of Langell Valley diversion dam and other miscellaneous work for the Klamath project; prepared detail designs for Horse Creek diversion dam and headworks, North Platte project; revised preliminary design for Pilot Butte reservoir and outlets; prepared preliminary design for check and by-pass on the Pilot Butte power plant; prepared detail designs for Willwood diversion dam; completed designs for highway bridge across Shoshone River for Willwood Division, Shoshone project; prepared article for RECLAMATION RECORD on experiences of the service in the manufacture and use of lock-joint pipe.

The principal work in the electrical division consisted of the following: Studies of the outlet works for the Hubbard Dam were continued; a conference was held in reference to the proposed new contract renewing the lease of the Lahontan power plant and transferring to the United States the water rights owned by the Nevada Valleys Power Co., Newlands project; consideration was given to the protest of John T. Clarke against the construction of the Pilot Butte power plant, Riverton project; designs of the outlet works for the Tieton Dam, Yakima project, were under construction during the month, but the detail design of the needle valve is being held up pending consideration of the results of recent tests at the Pathfinder Dam and tests of the 4-inch experimental needle valve to be made on the Shoshone Dam; and work was carried on in reference to the possible extension of the Yuma Valley drainage pumping plant, Yuma project.

The cost and property section arranged for the transfer of approximately \$20,000 worth of equipment and sales were made, amounting to a little over \$1,500.

The two most important matters considered in the legal section were furnishing of free water to public-school grounds on the Orland and North Platte projects and excess holdings in Big Coulee Division, Sun River project.

In the purchasing section 394 advertisements were issued and 376 vouchers prepared, involving a net expenditure of \$71,082.69.—*F. E. Weymouth.*

The El Paso Herald edition of June 17 was a Reclamation Service anniversary number, carrying statements by prominent water users and original local promoters of the Rio Grande project, concerning the advantages of Reclamation Service work and the results obtained.

The preliminary crop report shows that there are nearly 4,000 acres in potatoes on the Shoshone project. The acreage in 1921 was 1,962.

ADMINISTRATIVE ORGANIZATION.

DEPARTMENT OF THE INTERIOR.

HON. ALBERT B. FALL, Secretary of the Interior.
 EDWARD C. FINNEY, First Assistant Secretary.
 FRANCIS M. GOODWIN, Assistant Secretary.
 EDWIN S. BOOTH, Solicitor for the Interior Department.
 CHARLES V. SAFFORD, Administrative Assistant to the Secretary.
 HARRY G. CLUNN, Private Secretary to the Secretary.
 JOHN HARVEY, Chief Clerk and Superintendent of Buildings.

U. S. RECLAMATION SERVICE.

WASHINGTON, D. C.

Arthur Powell Davis, director; Morris Bien, assistant director; Ottomar Hamel, chief counsel; J. B. Beadle, director's assistant; C. J. Blanchard, statistician; Hugh A. Brown, editor and office assistant; IC. A. Bissell, engineer; J. M. Luney, chief accountant; Miss H. A. Fellows and Raymond Depue, fiscal agents; C. H. Fitch, chief clerk; Emmet Carr, purchasing agent; G. W. Numbers, appointment clerk; H. N. Bickel, Yakima, Wash., W. A. Meyer, Denver, Colo., and W. F. Kubach, Great Falls, Mont., examiners of accounts.

DENVER, COLO.

F. E. Weymouth, chief engineer, Tramway Building, Denver, Colo.; R. F. Walter and C. P. Williams, assistant chief engineers; Miss L. H. Meisel, secretary to the chief engineer; J. M. Gaylord, electrical engineer; J. L. Savage, designing engineer; James Munn, engineer; ———, chief clerk; A. McD. Brooks, purchasing agent; Harry Caden, fiscal agent.

FIELD LEGAL OFFICES.

Boise, Idaho.—B. E. Stoutemyer, district counsel. Projects: Boise, Minidoka, King Hill, and Jackson Lake Enlargement; R. M. Patrick, district counsel, located at American Falls, Idaho.

Denver, Colo.—Law section office of chief engineer: Armand Offutt, district counsel.

El Paso, Tex.—P. W. Dent, district counsel. Projects: Rio Grande, Carlsbad, and Hondo.

Las Cruces, N. Mex.—Mark B. Thompson, attorney in charge of litigation on Rio Grande and Carlsbad projects.

Helena, Mont.—E. E. Roddis, district counsel, Helena, Mont. Projects: Blackfeet, Flathead, Fort Peck, Huntley, Milk River, St. Mary Storage, Sun River, North Dakota Pumping, Lower Yellowstone, and Shoshone.

Mitchell, Nebr.—J. N. Beardslee, district counsel. Projects: North Platte, Belle Fourche, and Riverton.

Montrose, Colo.—J. R. Alexander, district counsel. Projects: Grand Valley, Uncompahgre, and Strawberry Valley.

Portland, Oreg.—H. L. Holgate and D. G. Tyree, district counsel. Projects: Yakima, Okanogan, Umatilla, and Klamath.

San Francisco, Calif.—Henry A. Cox and Brooks Fullerton, district counsel, 349 Pacific Building. Projects: Salt River, Yuma, Orland, and Newlands.

PROJECT ORGANIZATION.

Belle Fourche Project.—B. E. Hayden, project manager, Newell, S. Dak.; R. C. Walber, chief clerk.

Boise Project.—J. B. Bond, project manager, Boise, Idaho; E. R. Mills, chief clerk; C. F. Weinkauf, fiscal agent.

Carlsbad Project.—L. E. Foster, project manager, Carlsbad, N. Mex.; V. L. Minter, chief clerk and fiscal agent.

Grand Valley Project.—S. O. Harper, project manager, Grand Junction, Colo.; C. H. Young, chief clerk; A. H. Hall, fiscal agent.

Huntley Project.—A. R. McGinness, project manager, Ballantine, Mont.; G. H. Bolt, chief clerk; Miss M. C. Simek, fiscal agent.

King Hill Project.—Walter Ward, project manager, King Hill, Idaho; T. W. Hause, chief clerk; L. D. Eakin, fiscal agent.

Klamath Project.—H. D. Newell, project manager, Klamath Falls, Oreg.; N. G. Wheeler, chief clerk; G. R. Barnhart, fiscal agent.

Lower Yellowstone Project.—L. H. Mitchell, project manager, Savage, Mont.; C. A. Denman, chief clerk.

Milk River Project.—G. E. Stratton, project manager, Malta, Mont.; H. A. Parker, engineer; E. E. Chabot, chief clerk; G. S. Moore, fiscal agent.

Minidoka Project.—Barry Dibble, project manager, Burley, Idaho; Dana Templin, engineer; E. C. Diehl, chief clerk; Miss A. J. Larson, fiscal agent; F. A. Banks, engineer, American Falls, Idaho.

Newlands Project.—J. F. Richardson, project manager, Fallon, Nev.; A. W. Walker, engineer; G. B. Snow, chief clerk and fiscal agent.

North Dakota Pumping Project.—W. S. Arthur, project manager and chief clerk, Williston, N. Dak.; H. C. Melaas, fiscal agent.

North Platte Project.—Andrew Weiss, project manager, Mitchell, Nebr.; H. W. Bashore, engineer, Fort Laramie Division; Paul Rothi, irrigation manager; J. R. Ummel, chief clerk; Miss A. L. Perrine, fiscal agent.

Okanogan Project.—Calvin Casteel, project manager, Okanogan, Wash.; W. D. Funk, chief clerk and fiscal agent.

Orland Project.—R. C. E. Weber, project manager, Orland, Calif.; E. T. Eriksen, engineer; C. H. Lillingston, chief clerk and fiscal agent.

Rio Grande Project.—L. M. Lawson, project manager, El Paso, Tex.; T. W. Parry, irrigation manager; C. A. Peavey, chief clerk; L. S. Kennicott, fiscal agent.

Riverton Project.—H. D. Comstock, project manager, Riverton, Wyo.; R. M. Conner, engineer; G. H. Murphy, chief clerk; Miss Grace M. McCarthy, fiscal agent.

St. Mary Storage Division.—R. M. Snell, project manager, Brown-ing, Mont.; F. H. Shiner, chief clerk, and fiscal agent.

Salt River Project.—Being operated by the Salt River Valley Water Users' Association; C. C. Cragin, general superintendent and chief engineer, Phoenix, Ariz.

Shoshone Project.—J. S. Longwell, project manager, Powell, Wyo.; J. R. Iakisch, engineer; C. M. Jump, superintendent of irrigation; W. F. Sha, chief clerk; Miss L. C. Drinkwater, fiscal agent.

Strawberry Valley Project.—W. L. Whittemore, project manager, Provo, Utah; J. E. Overlade, chief clerk and fiscal agent.

Sun River Project.—G. O. Sanford, project manager, Great Falls, Mont.; H. W. Johnson, chief clerk; Miss M. G. Valentine, fiscal agent; G. A. Benjamin, irrigation manager, Fairfield, Mont.

Umatilla Project.—H. M. Schilling, project manager, Hermiston, Oreg.; G. C. Patterson, chief clerk and fiscal agent.

Uncompahgre Project.—L. J. Foster, project manager, Montrose, Colo.; C. B. Funk, chief clerk and fiscal agent.

Yakima Project.—J. L. Lytel, project manager, Yakima, Wash.; R. K. Cunningham, chief clerk; J. C. Gawler, fiscal agent; M. D. Scroggs, superintendent of irrigation, Sunnyside, Wash.; J. S. Moore, superintendent of irrigation, Route 6, Yakima, Wash.; F. T. Crowe, engineer in charge construction Tieton Dam, Rimrock, Wash.; C. F. Gleason, engineer; V. G. Evans, chief clerk.

Yuma Project.—P. J. Preston, project manager, Yuma, Ariz.; R. M. Priest, superintendent of construction; S. A. McWilliams, engineer, Yuma Mesa Division; E. R. Schepplmann, chief clerk; E. M. Philebaum, fiscal agent.

INDIAN PROJECTS.

Blackfeet Project.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk and fiscal agent.

Flathead Project.—C. J. Moody, project manager, St. Ignatius, Mont.; J. M. Swan, chief clerk; J. P. Siebeneicher, fiscal agent.

Fort Peck Project.—S. A. Kerr, project manager, Poplar, Mont.; Henry Berryhill, chief clerk and fiscal agent.

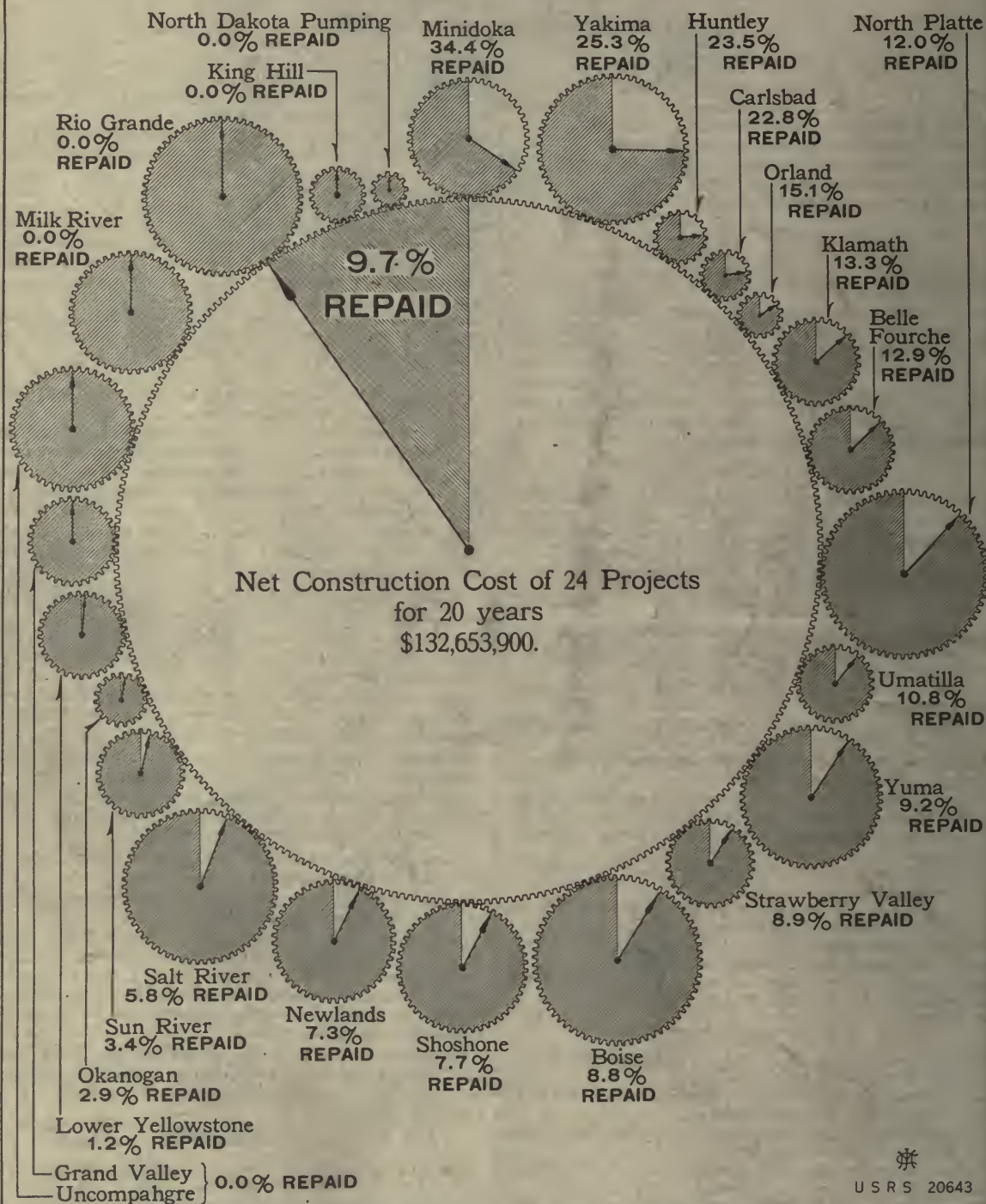


FIG. 10.—Per cent which repayments by each specified project represent of project net construction cost, showing how these repayments affect the revolution of the reclamation fund as a whole.

The Reclamation Record

An ADMINISTRATIVE and STATISTICAL REPORT

Issued Monthly by the RECLAMATION SERVICE, DEPARTMENT OF THE INTERIOR, Washington, D. C.

CERTIFICATE: By direction of the Secretary of the Interior the matter contained herein is published as administrative (or statistical) information and is required for the proper transaction of the public business.

VOLUME 13, No. 8

AUGUST, 1922

LIVE STOCK ON RECLAMATION SERVICE PROJECTS OFFERS MOST PROFITABLE MEDIUM FOR MARKETING ALFALFA.

MANY farmers on reclamation projects realize that too much of a good thing may be almost as bad as none at all. Alfalfa is a good thing; that is, it is an excellent feed for nearly all kinds of live stock. But if there is a great deal of hay and a scarcity of hungry mouths to consume it, then, instead of being valuable, it is a liability, and the problem is to make it into an asset. Whenever there is a surplus, it is natural, reasoning from the experiences of growers of various kinds of crops, to think of organizing a co-operative association for marketing it economically and at a profit. But hay differs from a large share of other products that are shipped about the country. It is bulky. And nowadays freight rates are high enough to throw a shadow clear across a good-sized hay field.

SHIPPING HAY IS A BAD PRACTICE.

As an emergency measure an association to sell off a surplus of alfalfa may be advisable, but the general practice of shipping out this crop is economically unsound. It is not a concentrated product, but it is easily possible to concentrate it into more valuable products that in most years will return a much better profit than the raw hay, and at the same time build up the fertility of the land, or at least maintain it.

Manure is as necessary on irrigated as on nonirrigated land, and some authorities believe that it is even more important on irrigated land. At any rate live stock, particularly the dairy cow, can be depended upon to turn in a regular profit. Milk or meat may not ever bring in the big returns that are sometimes realized from other crops for a short time, but experience on the reclamation projects has shown convincingly that they offer the best solution of the problem of getting a good price for surplus crops, or even for the entire product. It is poor business for a farmer who is growing alfalfa in a place distant from the markets to sell the hay, which often nets only 50 cents a ton, when he might very well be putting it through live stock and getting \$5 or \$6 a ton clear profit.

Because this practical solution is available to growers in these large alfalfa-growing localities it

would seem that associations for the marketing of hay ordinarily are a waste of effort. Cooperative associations are commendable in most instances, but in this case it would seem that farmers should cooperate to obtain more and better live stock and to market it to the best advantage. There are some successful associations engaged in handling the production and marketing of certified alfalfa seed, notably in the Yuma Valley, where the Hairy Peruvian variety is grown to a large extent, but this is a different matter from marketing hay. There are also associations that have gone to some extent into what might be called manufacturing—the making and selling of alfalfa meal and chopped alfalfa.

The shipping of alfalfa hay to eastern markets through the Panama Canal has appealed to some Pacific coast producers as a partial solution of the problem of marketing alfalfa, but men who have been giving attention to the situation in these alfalfa-growing districts say that getting the hay to any of the distant markets in any way is so costly that very little profit can be expected. Ordinarily, alfalfa hay in this part of the country is worth somewhere near \$5 a ton in the stack.

Alfalfa that is sold off the farm must be baled, and this cost, added to the labor and other costs of getting it to the shipping point, will pile up an expense of \$4 to \$5 a ton on the average. So by the time the alfalfa is ready to start on its trip to market the investment in it has doubled. From then on until it reaches the ultimate consumer costs pile up enormously, so that a high price at the far-away market does not necessarily mean a profit to the grower.

MAKE STOCK RAISING A PERMANENT INDUSTRY.

But to do well with live stock as a means for marketing the alfalfa crop it is advisable to keep in the business steadily in order that there may always be stock on hand to use the feed. On some of the projects in the Southwest where conditions favor the growing of both cotton and alfalfa, variations in market conditions have caused heavy shifting from one crop to the other. When cotton is high in price, farmers turn

their alfalfa lands into cotton, and when there is a slump in cotton they turn to alfalfa, hoping to feed it to stock or sell it as hay. But a great increase in alfalfa production finds the country short on cattle and, consequently, there is a large surplus of feed that depresses the market, and the profit is hard to find. To make it a safe and sane business, there should be a large live-stock population to take care of this rough and bulky feed, which means that live-stock raising should be a permanent business.

On one of the projects in Nevada it was once the custom for sheep raisers to drive in their sheep to the farms, where they bought up the hay in the stack and fed it out at the place of production. Then dairymen in California began buying the hay and competing with the sheepmen, which was an excellent thing for the alfalfa farmers. The hay was marketed without trouble and the manure was left on the land. But this sort of thing was too good to last. More alfalfa was grown in this locality and in California. The sheepmen found places in the latter State that were nearer the shipping point and the price paid for hay went down.

Then these Nevada farmers got cows to consume the hay, and the milk producers returned \$10 to \$15 a ton for it. But during the war, when butter fat did not follow the upward trend with the celerity of meats and lard, these men deserted the cow for grain and meat production. They put their lands into hay again with the falling of live-stock and grain prices, but then the cattle were not there to consume the alfalfa profitably. The farmers were then back to the conditions of 1912 and 1913, when hay was held over from year to year because of the lack of a profitable market for it.

It is natural that a stockman who is looking for feed to buy for his animals will get it at the lowest possible price, and when he sees a country dotted with haystacks that have been held over from the previous year his idea of what hay is worth takes a sudden

and decided slump. The owners of the stacks must take what the buyer chooses to pay or hold it another year.

The dairy cow, the steer; or the hog nearly always provides a better market than anyone outside the farm can offer for alfalfa. This ought to be evident, at least in the case of the dairy cow, when it is known that butter fat at 40 cents a pound means \$15 a ton for the hay. In most dairy sections the feeding of cows is more complicated than has been found desirable in localities of plentiful and cheap leguminous roughage. On the projects where an average of about $3\frac{1}{2}$ tons of alfalfa hay are grown to the acre this feed is so cheap that it can be fed as the sole ration with good results. It is not what is called a balanced ration, but well-balanced farm economics demands that a feeder vary his rations in accordance with prices. In most years it does not pay to feed costly concentrates to induce a little greater milk flow.

A COMPLETE RATION FOR DAIRY COWS.

On one of the projects in the Southwest a man in charge of the development of the dairy industry thought that the alfalfa ration was wasteful of the cows' capacity for milk production. He introduced the feeding of mill feeds and other concentrates, but he soon gave it up and admitted that the increase in milk flow was not worth the extra cost of feeding supplements to the alfalfa hay.

Live-stock products may be marketed readily from the projects, even if the demand in near-by territory has been filled. Meat is a concentrated product, corn being condensed in the proportion of about 6 to 1 and alfalfa in much greater proportion. Butter fat is also a highly concentrated food. For this reason the distance away from market makes only a small difference in competing with producers in other parts of the country. Local conditions have little effect on the prices received by the producer who sells a product that can enter world markets without a high freight charge per unit of value.

SOME ODDS AND ENDS OF IRRIGATION PRACTICE.¹

By Dr. John A. Widtsoe, Salt Lake City, Utah.

THE irrigation farmer must be taught to use the water; must know how to use it; and his success determines the success of the project. The dam may be ever so fine; built according to all the laws of science and engineering, but if the man below the dam can not work as he should work, the project will fail. The farmer is the determining factor of success in irrigation.

¹ Portion of address by Doctor Widtsoe at the fifteenth annual convention of the Western Canada Irrigation Association, from the Irrigation Review.

This has been said before, I know, but we can not say it too often. The farmer must be able to make the water at his disposal go as far as possible and to make it yield the largest possible crop, the best crop, and to get it on the markets with the most profit. What is the first of all principles upon which depends the proper use of water? The beginning of irrigation wisdom from the point of view of the farmer, which is ultimately the view of all of us, is the conservation on the irrigated farm of the natural precipitation. Irrigation will never be a primary prac-

tice. Irrigation is a supplementary practice, supplementary to natural precipitation.

The first thing is so to till the soil as to enable it to hold the moisture that falls; to keep it in the soil, so that when the irrigation farmer works his land he will get more and better use of that water. The beginning of irrigation wisdom, then, is the use of the natural precipitation or the conservation of the natural precipitation.

The soil must be kept open to receive the rain and the moist soil must be mulched or tilled so as to check evaporation in the soil. The natural precipitation performs wonders in the soil. Fall plowing is usually very advantageous.

Irrigation can never and should never take the place of tillage. Only the unjust irrigation farmer is content by frequent irrigations to secure for himself a crop without proper soil tillage. Irrigation farming is made to prosper not only by the application of water, but by the proper tillage of the soil. If anything, it is more important to till the irrigated soil carefully with the plow, spade, or hoe than it is the unirrigated soil.

The man who attempts to practice irrigation farming by merely adding water to the soil, year after year, season after season, is only inviting ultimate disaster, and throughout his career will get poorer crops and smaller returns from the water than he would if he tilled the soil properly.

There is a principle that determines the time of irrigation. It is tremendously dangerous to oversaturate the soil. An irrigated soil should be kept just short of full saturation. There must be some air space in the depth of soil ordinarily occupied by plant roots. But it is just as dangerous for the irrigation farmer to allow his soils to dry out. Irrigated soils must never be allowed to dry out to the depth of the full zone of root growth. Irrigation should come just as frequently as the soil needs irrigation. The soil must not be allowed to become too dry. The more water applied, up to the danger point, at each irrigation, the longer the interval should be between irrigations.

I have not the slightest sympathy with frequent small irrigations except on shallow lands which naturally require such treatment. I believe in a few heavy irrigations on deep soils—that is, enough water to wet the soil well to the full depth of root growth. The time of irrigation has been mentioned. With a limited seasonal quantity of water, say 8, 12, or 24 acre-inches, at our disposal, when should we irrigate a wheat crop or a fruit crop? When should the first, second, or third irrigation be applied? This is a most interesting subject, for by varying the time of irrigation it is possible to control tremendously the quality and quantity of crops. The farmer has it in his keep-

ing to produce much straw or little straw, much grain or little grain, if he knows when to apply water.

I come now to another subject which I believe to be coordinate in importance with the previous subject, namely, the relationship between irrigation and soil fertility. I want to emphasize the fact that irrigation is most profitable on a fertile soil. Many farmers allow the soil fertility to diminish and depend upon the water to produce crops, consequently they do not succeed.

No land husbandry is permanently successful unless it is based in large part upon domestic animals. Unless the system of husbandry under irrigation involves the continuous use of cows, steers, sheep, and swine it is not likely to be permanent. By using a part of our land for such purposes and returning the manure to the soil we have the direct means of maintaining, to a certain extent, at least, the fertility of the soil; at the same time the farmer is a little more sure of his income.

One of the factors that determines the quantity of water needed to produce crops is the fertility of the soil. That is one advantage of having a soil of high fertility. Perhaps half the amount of water is sufficient on an orchard soil of high fertility as on less fertile soil.

How are we to perfect a practice of irrigation which complies with our best knowledge? The dream of all of us is, or should be, that irrigation as a practice shall be based, in time to come, on a series of well-known principles, just as sound and easily understood as any other principles underlying an important practice of humanity.

The measurements of water, the proper application of water, knowledge of soil, and educational activities are at least four highways along which the man may travel who succeeds in tilling the soil under irrigation.

Recent Reclamation Service Orders.

CIRCULAR LETTERS.

- No.
1141. Regulations for leasing land (C. L. 987).
1142. Classification of objects of expenditure.
1143. Crop reports.
1144. Hotel rates for Government employees.
1145. Economies in travel expense, San Francisco office of district counsel.
1146. Recommendations for promotion to be approved by water users association.
1147. Compromise of damages caused by canal breaks due to burrowing animals.
1148. Coal stocks and needs.

GENERAL LETTERS.

220. Appropriations, fiscal year 1924.
221. Estimates for appropriation for fiscal year 1924.

DITCH CLEANING HARROW FOR REMOVING MOSS AND WEEDS FROM CANALS AND LATERALS, KING HILL PROJECT, IDAHO.

By A. M. Rawn, Engineer, King Hill Project.

IRRIGATION water for the King Hill project is very clear and especially conducive to the growth of moss, which becomes so abundant in the canals by about the 1st of July that it is impossible to maintain the water supply to normal demand at that time and it is necessary either to turn the water out of the distribution system for three days to a week to kill the moss or to use some sort of rig which will cut the moss off beneath the water.

Inasmuch as it was not considered feasible to turn the water completely out of the system for sufficient time to kill moss, consideration was given to the various methods in use in this section for removing moss and weeds with water in the ditches. Among others considered was a type of disk harrow which for the past two years has been in use with marked success on the South Side Twin Falls project, and after inspection of one of the harrows it was decided to try out the machine on the King Hill ditches.

For the purpose of constructing the harrow the following parts were purchased: 8 disks, 20 inches diameter; 4 washers, bumper, 9½-inch, No. KK-667; 2 spools, spacing (used with ¾-inch square, ½-inch oversized shaft); 4 spools, bearing; 2 washers, K-1028; 2 top half boxings, KK-581; 2 bottom half boxings, KK-582; 2 top half boxings, KK-583; 2 bottom half boxings, KK-584; 4 sets wood boxings; 2 washers, 1-inch, round, cut; 2 nuts, 1-inch; 12 feet steel, medium, ¾-inch square, ½-inch oversized; 17 feet iron, strap, ¼ by 3; 20 feet iron, strap, ¾ by 2.

The 8 disks are assembled 4 each on a ¾-inch axle, the assembly on each axle being as follows: 9½-inch bumper washer, 20-inch disk, bearing spool, 20-inch disk, spacing spool, 20-inch disk, bearing spool, 9½-inch bumper washer, 20-inch disk, washer K-1028, 1-inch cut washer, 1-inch nut, and cotter pin.

The completed harrow resembles the letter **T** with the cross bar bent into a flat inverted **V**, each leg of the **V** forming an angle of about 80° with the stem which represents the pole. The pole is heavily ironed with a ring in its outer end for attaching to draft cable. The pole center line projected would pass 6 inches above the two disk axles in the harrow in use on this project, but it is believed that the center line of the pole and axles should be in the same plane, so that the harrow will operate with equal effect when it is inverted in the canal, as frequently happens.

The pole is attached to the disk axles at two points on each axle for an 8-blade harrow, the boxings being located on the bearing spools in each set of disks. For a 16-blade harrow now under construction on this project it is our plan to attach the pole to each axle at three points for additional strength. For con-

necting the pole to the axles heavy strap irons are run from pole to boxings in the form of hounds, the straps to the outer ends of the axles being bolted to the pole rigidly, whereas those to the inner boxings are bolted to the pole with one bolt only, allowing the inner end of each set of disks to move up and down to conform to the ground surface. Weight and strength are of great importance; therefore heavy strap iron should be used throughout for pole irons and hounds.

The harrow is dragged through the canal by means of a cable run through the pole ring and thence to a team on each bank. Three men and two teams operate the harrow; two of the men act as teamsters, while the third guides the harrow by slowing down each team as necessary.

The cost of mowing four different sections on the main canal during the latter part of June and early part of July was as follows:

Section No. 1 consisted of 4,700 feet of 22-foot base canal, with depth of water about 4 feet, both banks of which were about equal height. The field cost for this stretch was \$25.

Section No. 2 consisted of 1,400 feet of main canal, 28 feet bottom width and 4 feet depth of water, the banks of which were about of equal height. In this section the moss extended throughout the entire length almost across the entire channel. This stretch was mowed at a cost of \$12.50.

Section No. 3 consisted of 1,700 feet of main canal, with the same cross section as section No. 1 except that the canal is on steep hillside and necessitated the use of 200 feet of cable, divided 150 feet on one leg and 50 feet on the other. This stretch of canal cost \$27.

Section No. 4 consisted of a stretch of canal 2 miles in length, the banks of fairly uniform height and of about the same cross section as section No. 1, with the moss growing for the greater part close to the banks. This stretch of canal was mowed at a cost of \$19.

A marked advantage of the harrow is that within the limits of ordinary canal flow, depth and velocity increase its efficiency by moving out the cut moss. It is useful also in that it cuts down silt bumps, and if kept sharp it is successful in removing weeds from along the berm. It does not become choked with weeds and moss and it is never necessary to drag it from the water for cleaning.

From the limited experience with the machine on this project it is our opinion that the 8-blade harrow will be most effective in laterals up to 10 feet bottom width; for large canals one with about 16 blades will be most efficient.

CORE WALLS FOR EARTH AND ROCK FILL DAMS.

By C. H. Howell, Engineer, U. S. R. S.

A CORE wall may be defined as a comparatively thin impervious diaphragm placed in the interior of a dam section composed of more or less pervious materials. The term "core wall" is applied in engineering literature to walls equal to or greater in height than the dam itself and also to much lower ones which might more properly be called cut-offs.

In common with other features pertaining to dams, core walls are the subject of much technical discussion; the different types adopted for similar conditions by men of equal ability indicate a wide divergence of opinion concerning them and illustrate most pointedly that what one authority considers correct another considers wrong.

It is quite generally conceded, however, that the use of core walls of any type is theoretically inefficient. The most desirable dam sections theoretically are (a) one entirely composed of impervious material, (b) one whose upstream half or third is thus composed, or (c) one having the upstream face impervious. In many cases the available material is such that none of these sections can be economically constructed. In such cases core-wall sections generally offer practical working solutions.

Core walls are divided into two general types—those built of masonry, concrete, or rubble, and those of "puddled" material. Combinations of both are used as well as diaphragms of steel and wood. In dams properly constructed of suitable material by the hydraulic method a comparatively large part of the central portion is automatically made the most impervious and becomes in effect a large puddle core.

Both of the two general types have inherent advantages and disadvantages, and both have been successfully used under similar conditions. Both are criticized because of their tendency to produce supersaturation in the upstream portion of the dam, a condition which may require either flatter upstream slopes or additional weight such as loose rock to prevent slipping. The masonry type is proof against attacks by burrowing animals; the puddle type is not. This is a very important advantage if the dam will have only occasional inspection. A crack in a masonry wall is not attended by so much danger as a breach or puncture in a puddle core, as it is most probable that the crack will tend to become sealed, whereas in the puddle the breach will tend to enlarge. The masonry wall is better adapted than the puddle to making connections with outlet conduits, rock or masonry abutments, and rock foundations. The masonry wall also, if placed on line with the upstream edge of the crown, can be readily extended above the top of the dam to form a parapet and additional freeboard thus secured.

On the other hand, as the puddle core is flexible it is less liable to be ruptured by unbalanced pressures in the dam than the more rigid masonry wall. A puddle core section is more nearly homogeneous than one with a masonry wall and experience seems to indicate that they are somewhat more impervious. It is stated frequently that a masonry wall requires firm rock for the foundation. By correctly designing the footings, however, they may be built successfully upon softer materials. As puddle cores are flexible, they may be founded upon almost any material.

Puddle construction in general requires the exercise of good judgment and great care in the selection of materials and skill in their mixing and placing. This is especially the case in the construction of puddle cores by the hydraulic method. The horizontal pressures produced by the semifluid mass of the core must be resisted by the more stable material on each side. These pressures are not completely determinate and hence conservative assumptions in design and special care in construction must obtain to avoid slides. The construction of a masonry core is more in line with ordinary high-grade work.

Core walls constructed of rubble masonry have proven only comparatively impervious. In 1901 a board of engineers investigated several of the earthen dams of the New York Board of Water Supply. These dams were all built with rubble masonry cores. The investigation showed the presence of water below the cores in all of the dams. The loss of head attributed to the core wall varied from 7 to 40 feet, the average being about 21 feet, which was the amount the board believed could be assumed safely in other designs.

According to Parker's "Control of Water," a well-made puddle core produces a drop of 20 to 30 feet in the line of saturation. This is confirmed by tests in the Wachusett Dike, which indicated a loss of about 30 feet.

The loss of head may, of course, be increased by securing greater density in the core itself, but it is generally admitted that no matter which type is used or what precautions are taken, the core itself should be considered as comparatively and not completely impervious and that the necessity for drainage provisions in the downstream portion of the dam is not entirely removed by the adoption of cores of either masonry or puddle.

Most authorities agree that puddle cores (not hydraulicked) should be composed of clayey material mixed with sand and gravel, the theory being the same as in proportioning concrete; that is, to fill the voids between the larger components with the particles of the smaller. In "Irrigation Engineering," by

A. P. Davis and H. M. Wilson, the following proportions are given as forming a satisfactory core:

	Cubic yards.
Coarse gravel, held on a 2-inch sieve_	1.00
Fine gravel, held on No. 4 sieve_	.35
Sand, held on No. 100 sieve_	.40
Clay and silt, passing No. 100 sieve_	.25
Total_	2.00

"These proportions, when well mixed and compacted with a small quantity of water and rolled, can be reduced to about $1\frac{1}{2}$ cubic yards in bulk."

Mr. J. T. Fanning, in "Treatise on Water Supply Engineering," makes the sand and the clay content 0.15 and 0.20 cubic yard, respectively, using the same proportions of fine and coarse gravel. Mr. E. Wegman states in "Design and Construction of Dams" that "pure clay is not suitable material for a puddle core, as it swells when wet and shrinks and cracks when dry, making its use very dangerous in any part of a dam where it may be alternately wet and dry."

The dimensions of puddle cores must be determined by judgment and experience. In existing structures the dimensions as well as the shapes vary greatly. The following dimensions for hand-placed cores are proposed by Mr. Wegman: Four to eight feet thick at high-water line, both sides battered uniformly so that at the ground surface the thickness shall be one-third the head. The thickness at the bottom of the trench should be at least one-half that at natural ground surface, but not less than 4 or 5 feet. In the large hydraulic fill dams of the Miami Conservancy District the width of the puddle core at any point is equal to the height of the dam above that point.

The excavation below the natural ground surface should be made wedge-shaped in cross section, as a tighter connection will thus result when the puddle is placed than if the sides be vertical or stepped.

The dimensions of masonry core walls are also largely matters of judgment and experience. One method, although not a complete analysis, which has been suggested as an aid to the judgment is as follows:

Let A =the portion of the area of the section upstream from the core wall and above the angle of repose of the saturated material.

W =the saturated weight per cubic foot of A .

B =the portion of the area of the section downstream from the core wall and above the angle of repose of the material.

W' =the weight per cubic foot of B .

AW_h =horizontal component of AW .

BW'_h =horizontal component of BW' .

Then the shear at the base= $S=AW_h-BW'_h$ and the indicated thickness= $\frac{S}{V}$ where V is the allowable unit, shear.

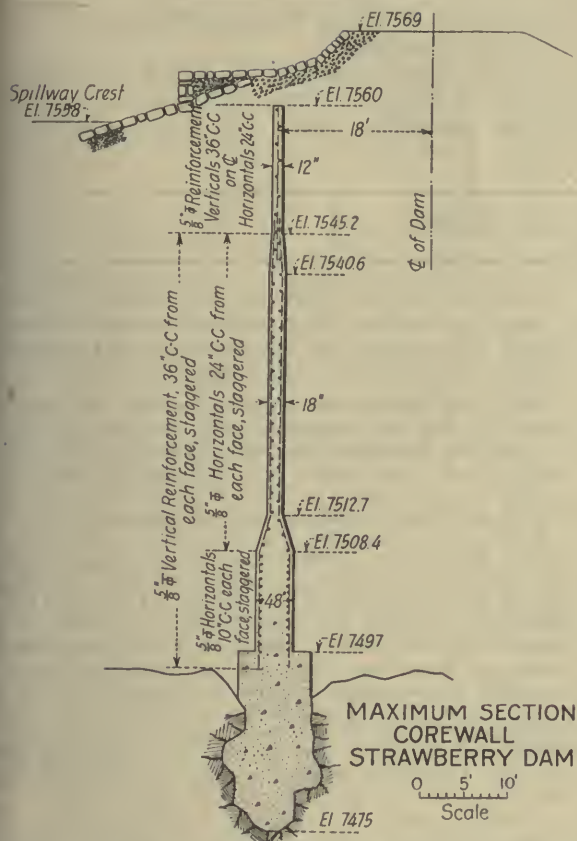
The thickness assumed as required for percolation may or may not agree with the above and is in turn a matter about which authorities differ. Mr. Clemens Herschell gives 4 or 5 feet for the bottom thickness, 8 at the ground line, and 4 at the top. Mr. Wegman gives $2\frac{1}{2}$ to 6 feet thickness at the top that at the ground surface from one-sixth to one-seventh the head, the increase being equal on each side and accomplished either by batters or by offsets 10 feet apart. Other authorities strongly condemn the use of offsets and insist on straight batters.

Diaphragms of wooden sheathing have been used occasionally instead of puddle or masonry. This type can not be considered as permanent. The plane between the planks and earth can not be made as tight as with masonry or puddle; consequently there is more danger of leakage. For temporary construction and also in low dams where the impounded water has a high silt content which may be expected to seal the dam a wooden core might be favorably considered, especially where extreme economy is first cost is essential, but one should never be placed in an important permanent structure.

Steel plate diaphragms coated with asphalt have been used in a few cases. They can be constructed so as to be completely impervious at first and if well coated might be expected to last for a long time. They can not, however, be considered as permanent as masonry or puddle. Their economy is, therefore, questionable and their use is not increasing.

The masonry core walls built by the Reclamation Service are all of concrete and in general are comparatively thin sections. The highest in service at the present time is in the Strawberry Dam, Strawberry Valley project, Utah. The maximum section of this wall is shown in the accompanying illustration.

The Tieton Dam, Yakima project, Washington, now under construction will be the highest earth dam built by the Reclamation Service. It will be an earth and rock fill section, approximately 220 feet high with both a concrete core wall and a hydraulicked puddle core. The puddle core will have a maximum width of 70 feet at base of dam. It will be placed against the upstream face of the concrete core wall. The concrete portion of the core wall extends to a maximum depth of about 100 feet below the river bed. In general it will be founded on andesite, although a small portion will rest on shale. A minimum penetration of 5 feet into both shale and andesite is specified which is to be increased, if necessary, according to the character of the material which may be encountered. Where the foundation is in shale the footing will be spread out to limit the pressure due to weight of the wall itself to 8 tons per square foot. The reinforcing of the spread footing will consist of 20-pound rails at 12-inch centers. On andesite the maximum thickness will be 5 feet.



The design of the maximum section is shown in the accompanying illustration.

Only two dams have been constructed by the Reclamation Service with puddle cores in the strict sense of the term and these were constructed by hydraulicking. The dams thus built are the Conconully Dam on the Okanogan project and the Bumping Lake Dam on the Yakima project.

The Conconully Dam was constructed by the hydraulic method, but as the fill increased in height it was found impossible to secure a central impervious portion of sufficient thickness, due to the decreasing percentage of fines and the narrowness of the pond. Loam therefore was borrowed from the valley floor and then sluiced into place between wooden forms which were placed to prevent strata of sand being washed in from the other material.

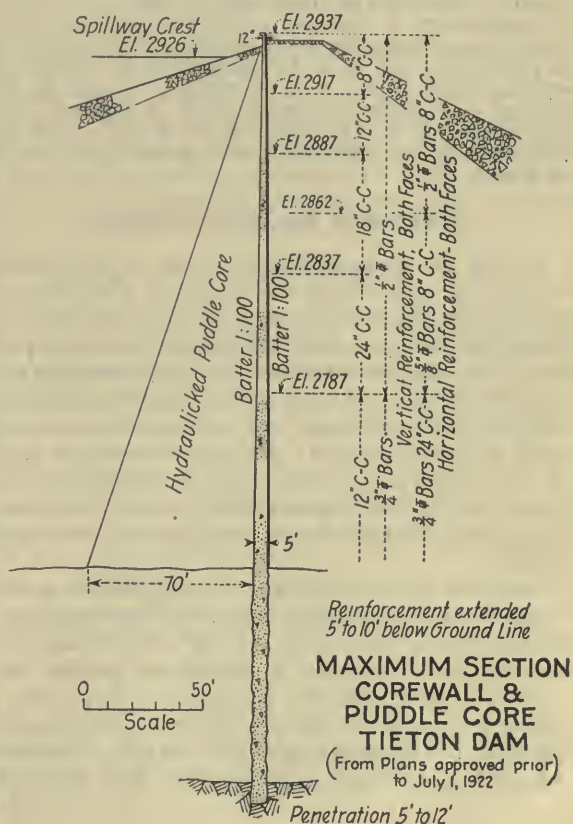
This puddle core is 8 feet thick at its base 14 feet above the base of the dam; the thickness at its top is 5 feet. In section this core is not vertical, but slopes upstream about 30 feet from its top, which is under the upstream edge of the crown. Its vertical height is about 40 feet.

The Bumping Lake Dam was built by hauling the material on to the dam, then separating and consolidating it by hydraulicking, the fines being sluiced toward the center and forming a puddle core. The

puddle was built by this method up to about spillway level, a distance of about 50 feet from the bottom. At this elevation similar difficulties in the hydraulic method developed as on the Conconully Dam and the rest of the puddle material was dumped and worked by shovels. The maximum height of the Bumping Lake core is about 60 feet. The horizontal dimensions are variable; in the hydraulicked portion they range from about 20 feet near the bottom to about 2 feet at the spillway elevation. The portion placed by hand averages about 4 feet thick.

The core walls and puddle cores constructed by the Reclamation Service have proven adequately tight, and so far no trouble due to saturation has developed in the upstream portions of the dams in which they are built. Somewhat extended reading indicates that the above is generally true of other well designed and constructed dams. Both types have been in service for years and doubtless will continue to be used in the future, offering, as stated before, practical and economical solutions when more theoretically correct sections are not feasible.

A most unusual core was built in the Sherburne Lakes Dam by the Reclamation Service as a part of the drainage system of the dam. This drain consists of a core of screened gravel, 5 feet thick at the top, 10 feet thick at the bottom, and about 83 feet high,



with side slopes of 3:100. This core is placed approximately under the downstream edge of the crown and extends the full length and height of the dam. The most impervious material in the dam is placed above the core and the coarser below. A cast-iron pipe with open joints is in the bottom of the core and

connects with transverse discharge drains, which lead back into the stream.

This construction thus far has proven satisfactory, although it has not yet been thoroughly tested, having been subjected to a head of only 45 feet and being designed for 68 feet.

RECLAMATION LAW NOTES.

Navigability of Rivers.

IN the case of *Oklahoma v. Texas* (66 L. Ed. 444), the United States Supreme Court, in deciding that no part of the Red River within the State of Oklahoma is navigable, laid down the following rules concerning tests of navigability:

Navigability of the Red River, where it forms the boundary between Oklahoma and Texas, can not legally be inferred from the action of the Government surveying officers, who, when surveying the land in that region, ran a meander line along the northerly bank and did not extend township and section lines across the river.

The fact that Congress, in permitting the construction of certain bridges across the Red River within Oklahoma, provided, in substance, that there should be no interference with navigation, was not an affirmation of the navigable character of the river in that locality, regardless of actual conditions.

Navigability in fact is, in the United States, the test of navigability in law; and whether a river is navigable in fact is to be determined by inquiring whether it is used, or is susceptible of use, in its natural and ordinary condition, as a highway for commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water.

Channels of Navigable Streams.

In 1921 the State of Kansas passed an act (Laws 1921, c. 272), providing that whenever a channel of a navigable stream is so changed that the land between the old banks is abandoned by the water and a new channel is established, the land forming the old channel shall be sold by the State auditor and patented to the purchaser, and the proceeds therefrom shall be applied, first, to payment of expenses, and, second, to payment to owners of land taken by the stream for the new channel for the value of the land so taken, the balance, if any, to be paid into the State treasury.

The Kaw River, a navigable stream, having established a new channel near the town of St. Marys, the owners of the land taken by the new channel requested the State auditor to execute the statute. He refused to do so upon the ground that the statute is based upon an erroneous assumption of fact respecting what the State owns and that the provision relating to the distribution of proceeds is illegal and void.

The Supreme Court of the State of Kansas in *State ex rel. Hopkins, Atty. Gen. v. Turner, State auditor* (207 P. 223), upholds the position taken by the State auditor. We quote from the opinion:

Before the change of channel occurred, the State owned the bed of the stream. The petition does not tell how the change of channel occurred, whether by gradual and imperceptible relinquishment of one and acquisition of the other or by sudden and violent eruption of the water, whereby the new channel was cut and the old one deserted. If the change was accomplished by the first method, the State no longer owns the old channel and has nothing to sell. If the change was accomplished by the second method, the State does not own the new channel and would get nothing for its money. Assuming the change was caused by flood, the State has full jurisdiction over the river in its present location for preservation and protection of its public highway character; but the proprietors whose lands were invaded and degraded by the avulsion still own the bed and banks of the stream. *Fowler v. Wood*, 73 Kans. 511, 529, 85 P. 763, 6 L. R. A. (N. S.) 162, 117 Am. St. Rep. 534.

* * * * *

The legislature may not make a gift of public money, any more than it may make a gift of public property, for the private benefit of an individual (*Winter v. Myers*, 92 Kans. 414, 140 P. 1033), and that would be the result of selecting a few flood sufferers of a special class and reimbursing them for their losses.

Riparian Rights in California.

From the opinion of the District Court of Appeal, Second District, Division 1, California, in the case of *Rindge et al. v. Crags Land Co. et al.* (205 P. 36), the following is taken:

It is established in California that a person may be possessed of rights as to the use of the waters in a stream both because of the riparian character of the land owned by him and also as an appropriator. An appropriator can gain nothing as against riparian rights which have attached, and once such rights have become affixed, they continue and are not lost, regardless of whether the water has been put to any beneficial use upon the land; the right is one continually and perpetually appurtenant. There would remain, then, as subject to appropriation, only the excess water over and above what might reasonably be subjected to a beneficial use by the lands bordering the stream. As to land held by the Government, it is not considered that a riparian right has attached until that land has been transmitted to private ownership; hence an appropriator, having in sufficient man-

ner taken possession of the waters of a stream, and actually subjected them to a beneficial use, may claim a continuance of the use, even though that use leaves land which belonged to the Government at the time of the appropriation without sufficient to supply riparian needs; hence the subsequent owner takes his ownership as affected by the right of the appropriator.

* * * * *

And thus it may happen that a riparian owner, being insufficiently supplied with water by the flow of a stream, and anticipating the attaching of other riparian claims when the Government land above him may be transferred to private ownership, may, upon such Government land, make an appropriation which will be good, although it may have the effect to rob entirely the upper property of any riparian right in the stream—this to be qualified only with the condition that the total water claimed under the combined rights does not amount to more than is reasonably necessary to satisfy the necessary uses to which it is designed to be put.

Use of Seepage from Drainage Ditch Reservoir in Colorado.

A reservoir company is not entitled to seepage from its drainage ditch reservoir as part of its original diversion and appropriation where the seepage will ultimately return to the river from which the water was taken, but it is to be treated as part thereof so that it can be appropriated only subject to existing priority rights. (Fort Morgan Reservoir & Irrigation Co. v. McCune (Colo.), 206 P. 393.)

Construction of Ditches to Avoid Waste.

Persons diverting water from a stream for the irrigation of arid lands must construct their ditches in such manner that there will be the least possible waste of water therefrom. In offering evidence as to the duty of water the inquiry is properly directed to the amount of water necessary to be diverted from the stream in order to properly irrigate the land, and the question of the reasonableness or unreasonableness of the loss from the ditch through seepage and evaporation is a proper subject for inquiry. (Clark et al. v. Hansen (Idaho), 206 P. 808.)

Delivery of Water by Irrigation District.

Where an irrigation district is without funds or the necessary credit to pay for the delivery of water a writ of mandate against the board of directors will not lie to compel a delivery of water to the users, since courts will not issue a command to the officers of a municipal corporation which such officers can not obey. (Cowan v. Lineberger (Idaho), 206 P. 805.)

Proceeding to Test Legality of Irrigation District Organization in Utah.

A proceeding whereby no relief is sought on behalf of plaintiffs but is brought merely to have it adjudged that the proceedings for organization of defendant

irrigation district were void, and for injunction, can not be maintained by private individuals, such a proceeding in rem, to be effective, needing special legislative authorization; but the proceeding by the district's directors for testing the legality of the organization provided for by Laws 1919, chapter 68, as amended by Laws 1921, chapter 73, is exclusive, and this though the directors refuse to institute it. (Surage v. McKay, 206 P. 722.)

Collection of Assessments by Water Users Association in Idaho.

The Payette-Boise Water Users' Association brought suit against Sherman D. Fairchild, one of its members, to secure personal judgment for the amount of an assessment levied by the association. Fairchild contended that under his subscription contract for shares in the association a lien to secure assessments was created, which lien could be enforced only by foreclosure and sale as in the case of mortgages, and that the association in an action to force collection of the assessment could not segregate from the contract the simple promise to pay such assessments and sue on the contract for a personal judgment without foreclosure. The defendant obtained judgment in the trial court which was sustained by the Supreme Court of Idaho, in Payette-Boise Water Users' Association, (Ltd.) v. Fairchild, 205 P. 258.

Transfer of Irrigation Water in Washington.

One to whom percentages of the water of a stream have been decreed on account of ownership of two tracts thereon, may use on his lower tract the part of the water decreed on account of his ownership of the upper tract, which he has not developed. (Osborn et al. v. Chase et al. (Wash.), 205 P. 844.)

Damage on Account of Shortage of Water.

On March 1, 1919, Laura Bryant leased to Martin Dow for one year certain land in Big Horn County, Wyo., "together with sufficient water from the Lewis extension of the R. Bahr Canal to irrigate" the same, for the sum of \$500. Later the tenant refused to pay the rental on the ground that the owner agreed to furnish sufficient water to irrigate the land and did not do so, with the result that the tenant's crops were damaged in an amount in excess of the rental. The Supreme Court of Wyoming in Dow v. Bryant (206 P. 1061), denied the claim of the tenant upon the ground that the parties to the lease knew that water would be supplied according to priorities and that there was likely to be a scarcity.

—Ottamar Hamelc.

The Salt River Valley Water Users Association has paid the first installment of \$55,000 on its delinquent payments, in accordance with the contract recently executed.

THE LITTLE BITTER ROOT VALLEY, FLATHEAD (INDIAN) PROJECT.

By B. A. More, Secretary Water Users' Association, Hot Springs, Mont.

THE Little Bitter Root Valley is the western portion of the Flathead project. It is a fertile tract containing 11,000 acres of land. The soil is a fine volcanic ash, free from rock, and averaging better than 200 feet deep. The valley is surrounded by low bunch-grass hills. This grass grows rapidly in the spring and later in summer cures standing, making the finest kind of winter grazing. These hills join the national forest, which has thousands of acres of excellent summer range. Here in the Little Bitter Root Valley lies an unlimited opportunity for the man who wishes to engage in the raising of cattle or sheep. In a short time the irrigated lands will be producing thousands of tons of alfalfa hay. The bunch-grass hills furnish an abundance of fall, winter, and early spring grazing. The forest has thousands of acres for summer range. Some fine herds are already being handled in this way, and there is room for many more.

With the coming of alfalfa and irrigated pastures the dairy industry is becoming popular. We have a modern creamery at Hot Springs, which furnishes a ready market for butter fat. The skim milk with alfalfa makes the hog industry a real money maker. Several fine herds of registered Holsteins have been started and the increase will find a ready market at home for years to come at fancy prices.

No place in the United States is better adapted to the raising of seed than our valley. Some of our ranchers are already making good money raising registered Cossack and Grimm alfalfa seed. Others are putting in fields and getting them registered to demand top prices for their product. Our registered seed last year sold readily for 85 cents per pound, and the yield was from two to five hundred pounds. W. W. Perkins, our pioneer in this line of industry, realized \$1,060 for his first crop of Cossack seed from 3 acres. Seed potatoes, peas, and grains will be raised extensively.

In the valley proper artesian wells are quite numerous and range in temperature from 42° to 120°. The water is soft and ideal for domestic purposes. For greenhouse or poultry raising it can be piped in the various buildings, thus furnishing cheap and even heat to insure success in these lines of endeavor.

The hot springs from which our town gets its name are being developed, and many people come here for the hot baths and hot muds.

Excellent roads connect our valley with Plains and Perma, our shipping points on the Northern Pacific Railroad, which are a few hours' run from Butte, Helena, Anaconda, Missoula, and Spokane. These cities and many of the other mining centers require

most of their supplies shipped in, thus assuring us a good market.

The Little Bitter Root Valley extends a hearty welcome to anyone wishing to make a real home in "The Garden of the Rockies."

How to Figure Project-Construction Cost.

The following article, which appeared in a recent issue of the Montrose (Colo.) Daily Enterprise, was prepared by Mr. C. O. Earnest, one of the water users on the Uncompahgre project and formerly president of the Home State Bank of Montrose, Colo. The article contains much food for thought.

"Actual cost of water under the Gunnison irrigation project is only \$30.30 per acre with 8 per cent money.

"There is much being said about the \$70 per acre construction charge for the water under this project. This is not so if you figure it as a part of the purchase price of the land.

"If you are buying 40 acres of our good land at \$200 per acre and you are told that you will have to pay an additional \$70 per acre for construction charges, if you want to figure the actual cost to you just figure that you will pay that now the same as you do the other \$200 per acre. In order to do this you simply invest \$30.30 per acre in good real estate notes, and the earned interest and principal will just pay out the \$70 per acre as the payments are called for. If you want to invest the money with which to pay this in 6 per cent city bonds or school warrants, it will take just \$36.50 to pay out the \$70 construction charge.

"Thus, when a man buys a ranch to-day, if money is worth 8 per cent, he need invest only \$30.30 to take care of this construction charge, or if the money is worth only 6 per cent he will invest \$36.50.

"Figuring from 1910, the time of the completion of the tunnel, \$12.12 per acre invested in 8 per cent securities would pay the construction charge, or \$18.25 per acre invested in 6 per cent securities would have done the same.

"It is not a fair proposition to figure the full \$70 as the cost when you do not pay it all for 20 years. It is simply paying a little less than 5 per cent per year for this money for 20 years and then have the debt canceled."

Five tons of cherries, including the Bing and Lambert varieties, were shipped from Polson on the Flathead (Indian) project recently to various points in Montana and Wyoming.

ADMINISTRATIVE AND STATISTICAL PROGRESS REPORTS FOR JULY, 1922.

Monthly conditions of principal Reclamation Service reservoirs for July, 1922.

[Elevation above sea level.]

State and project.	Reservoir.	Available capacity in acre-feet.	Elevation.		Storage in acre-feet.			Out-flow in acre-feet.	Elevation of water surface.		
			Spill-way crest. ¹	Lowest gate sill. ²	Beginning of month.	End of month.	Maximum.		Beginning of month.	End of month.	Maximum.
Arizona, Salt River	Roosevelt ³	41,305,000	2128.1	1924.6	877,388	767,149	877,388	.....	2117.31	2108.98	2117.31
California, Orland	East Park	51,000	1199.68	1111.68	46,660	30,940	46,660	14,300	1197.27	1187.08	1197.27
Idaho:											
Boise	Arrowrock	280,000	3211	2956	277,700	178,160	277,700	239,176	3211.4	3172.8	3211.4
	Deer Flat	177,000	2518	2488	104,771	53,948	104,771	63,402	2509.6	2502	2509.6
Minidoka	Lake Wolcott	95,180	4245	4236	107,850	104,700	109,840	410,694	4246.07	4245.7	4246.2
	Jackson Lake	847,000	6769	6728	847,000	493,160	847,000	491,960	6769	6754.42	6769
Montana:											
Milk River	Nelson	38,500	2216	2200	31,300	27,000	31,300	2,750	2213.94	2212.44	2213.94
St. Mary storage	Sherburne	66,000	4788	4720	15,270	24,180	28,550	4,400	4747.7	4756.9	4761
Sun River	Willow Creek	16,700	4130	4085	13,355	12,686	15,267	1,400	4126.5	4125.8	4128.5
Nebraska-Wyoming, North Platte	Pathfinder	1,070,000	5852	5670	925,990	693,390	925,990	291,670	5845.26	5832.07	5845.26
	Lake Alice	11,400	4182	4159	7,569	3,116	7,569	.....	4176.6	4163.5	4176.6
	Lake Miniatare	60,760	4125	4074	43,988	26,906	43,988	.....	4116.7	4106.6	4116.7
Nevada, Newlands	Lake Tahoe	120,000	6230	6224	.....	.....	.....	7,600	6227.14	6227.07	6227.28
	Lahontan	273,600	4162	4060	273,600	246,020	273,600	43,800	4162.7	4159.1	4162.7
New Mexico:											
Carlsbad	McMillan	45,000	3267.7	3241.6	28,500	13,000	28,500	14,000	3264.6	3260.6	3264.6
Rio Grande	Elephant Butte	2,638,000	4407	4231.5	1,993,612	1,883,218	1,993,612	126,385	4389.5	4386	4389.5
Oregon, Umatilla	Cold Springs	50,000	621.5	560	43,400	27,100	43,400	15,242	617.05	604.02	617.05
Oregon-California, Klamath	Clear Lake	462,000	4540	4514	417,000	398,000	398,000	.....	4038.3	4037.62	4038.3
South Dakota, Belle Fourche	Belle Fourche	203,000	2975	2920	144,340	121,550	144,340	35,603	2966.9	2963.3	2966.9
Utah, Strawberry Valley	Strawberry	250,000	7558	7517	253,640	234,200	250,000	19,440	7558.5	7555.8	7558
Washington:											
Okanogan	Conconully	14,400	2290	2232	8,295	4,675	8,295	4,747	2275.5	2265	2275.5
Yakima	Bumping Lake	34,000	3426	3389	38,395	33,643	38,395	4,752	3429.5	3425.95	3429.5
	Lake Cle Elum	20,800	2134	2122	27,100	10,722	27,100	16,378	2135.35	2127.87	2135.35
	Lake Kachess	210,000	2258	2192	234,775	157,578	234,775	77,197	2261.07	2243.01	2261.07
	Lake Keechelus	152,000	2515	2425	153,755	102,284	152,755	51,471	2515.42	2493.06	2515.42
Wyoming, Shoshone	Shoshone	456,600	5360	5132.3	470,083	449,951	470,083	154,173	5362	5359	5362

¹ Or maximum storage.² Or zero storage.³ Zero water depth at elevation 1902.2.⁴ Amount of silt shown by silt survey deducted from original capacity.⁵ Proposed regulation.⁶ Estimated low-water limit under proposed plan of regulation.⁷ Draft for power purposes.⁸ Elevation of reservoir raised 12 inches by stop logs in spillway.

SALT RIVER PROJECT, ARIZONA.

Operation and maintenance of irrigation system.—Water was run in all of the canals during July.

Five regular crews were in the field, and the following maintenance work was accomplished: 57 miles main canal cleaned; 350 miles laterals cleaned; 130 old structures repaired; 2,290 linear feet riprap placed; 13 cubic yards concrete placed; 420 cubic yards earth excavated; 385 cubic yards earth embankment placed.

In addition a demossing crew with 4 men and 16 mules demossed a total of 112 miles canal.

The Ruth dredger bermed 30,450 linear feet of the Grand Canal.

The P. & H. drag line bermed 3,679 linear feet of Base Line Pump Lateral.

The following construction work was accomplished: 62 new structures were installed; 116 yards concrete placed; 26 feet 30-inch concrete pipe placed; 762 linear feet 24-inch concrete pipe placed; 158 linear feet 18-inch concrete pipe placed; 22 linear feet 24-inch corrugated-iron pipe placed; 14 linear feet 30-inch corrugated-iron pipe placed; 2 miles new waste ditch completed; 5 miles new waste ditch partially completed; one-fifth mile new irrigation ditch completed; 6,687 cubic yards earth excavated.

The Ledgerwood drag line excavated 6,811 cubic yards.

Operation of power system.—Total generated during month, 9,903,290 kilowatt hours; maximum output for one day, 348,760 kilowatt hours; maximum load (July 29), 15,025 kilowatts; maximum daily average load (July 3), 14,450 kilowatts; highest daily load factor (July 10), 99.7 per cent; lowest daily load factor (July 4), 71.3 per cent; average daily load, 13,310 kilowatts.

New drainage pumping plants.—The pumps and motors were installed in the four new plants north of Phoenix. The outdoor substations for three of these plants were completed except the installation of transformers, which have not been received. The power lines to connect to these new plants were about 80 per cent completed at the end of the month.

Transmission line tower guying.—This work was completed during the month.

Roosevelt power plant.—The installation of the current-limiting reactors for the five small generators was completed and all in service July 9.—C. C. Cragin.

YUMA PROJECT, ARIZONA-CALIFORNIA.

July weather conditions were good, the absence of rain being particularly favorable for the alfalfa-seed

crop, harvesting of which was begun about the middle of the month. The average yield is about normal, with several high yields reported, although not so many as in some previous years. The price offered for seed was low and little was moving; the belief seems to be that the price will improve. Cotton was in excellent condition with every prospect of a good price for the crop. The county was preparing for the construction of over 40 miles of paved roads during the coming fall and winter.

The demand for water was less than for the same month last year, although cotton was being irrigated and alfalfa watered as the seed was taken off. Deliveries for July were 18,000 acre-feet, as against 22,000 for the same month in 1921. The Ruth dredges cleaned 10½ miles of laterals during the month; one machine was laid up on the 14th and another on the 20th. The 30-B Bucyrus continued cleaning the Main Drain, completing 1½ miles.

Mesa Division.—The 16-inch Krogh pump was operated 213 hours and delivered 319 acre-feet of water. The leveling of the Mesa units and other improvements are being carried on by the unit holders. The present program of pipelaying was completed the fore part of the month and the construction gang laid off. At the end of the month the work on the Mesa was confined to one small gang of workmen cleaning up and assembling equipment.—*Porter J. Preston.*

ORLAND PROJECT, CALIFORNIA.

The first carload shipments of apricots from Orland were made during July and consisted of two cars. These shipments are the result of young orchards coming into bearing. The larger portion of the third crop of alfalfa was harvested and resulted in a normal yield. The Orland alfalfa meal mill continued operations and purchased 1,800 tons of hay during the month.

An average force of five men and one team was engaged on maintenance work consisting of mowing and burning weeds on canals and laterals and dragging of operating roads. Approximately 15,000 acres were irrigated, to which 9,700 acre-feet of water were delivered.

Diamond drilling at Millsite was completed with the exception of two holes in the river bed where slow progress was made on account of boulders encountered before reaching bedrock. Double-shift drilling was started on the 14th to expedite the completion of the work for early transfer of both drill equipment and personnel to the Baker project.—*R. C. E. Weber.*

GRAND VALLEY PROJECT, COLORADO.

The weather during the first half of July continued hot and dry, but showers during the last few days ended the long drought and brought cooler weather. The digging of early potatoes was started about the 15th. The price realized for the potatoes shipped first was \$1.60 per hundred, but at the end of the month buyers were offering only 85 cents, and most of the farmers suspended digging. The second cutting of alfalfa was harvested, producing an average yield. The wheat crop has also been harvested, and threshing was in progress. Sugar beets, corn, and oats made a good growth, though somewhat retarded by the dry, hot weather. The campaign against grasshoppers was terminated, as the pest was brought under control in practically every part of the project. A few crops were injured to some extent, but the total damage over the project was comparatively small and the results of the poisoning campaign were successful,

The irrigation system was operated without interruption, delivering about 15,000 acre-feet of water to project lands and the two irrigation districts. Drainage construction was continued with two drag-line excavators which completed 4,500 linear feet of drain, involving 17,000 cubic yards of excavation.

Progress was made in assembling the outstanding bonds and warrants of the Orchard Mesa Irrigation District preparatory to liquidating the indebtedness under the terms of the contract. Work was started on the preparation of plans for the river crossing to connect the Orchard Mesa Canal with the project system.—*S. O. Harper.*

Prevailing crop prices at close of July, 1922.

Project.	Alfalfa hay, per ton.		Barley, per bushel.	Oats, per bushel.	Wheat, per bushel.	Potatoes, per bushel.
	In stack.	Baled at shipping point.				
Salt River.....	\$8.00	\$12.00	\$0.70	\$0.50	\$1.11	\$1.20
Yuma.....	8.00	12.00			.90	
Orland.....	8.00	12.50	.48		.94	
Grand Valley.....	8.00	12.00			.80	.60
Uncompahgre.....	7-12		.68	.45	.84	1.00
Boise.....	7.00	10.00	.65	.65	.78	.54
King Hill.....	8.00					.60
Minidoka.....	8-10				.78	
Huntley.....						
Milk River.....	8.00	12.00	.25	.25	1.06	1.20
Sun River.....	8.00	14.00	.70	.80	.97	1.20
Lower Yellowstone.....	8-10		.28	.16	1.08	.60
North Platte.....						1.20
Newlands.....	8.00	12.00				
Carlsbad.....		12.50				
Rio Grande.....		14.00		.62	1.11	
North Dakota pumping.....	12.00		.39	.41	1.41	1.50
Umatilla.....	10.00	14.00				
Klamath.....	8-10		.60	.40	.90	
Belle Fourche.....	5.00	9.00	.45	.35	1.10	1.50
Strawberry Valley.....	7.75	10.00	.90	.58	.60	1.35
Okanogan.....	16.00					1.60
Yakima.....		13-15				1.20
Shoshone.....						
Indian projects:						
Blackfeet.....	10.00		.96	.64	1.05	
Flathead.....	10.00				.86	1.14
Fort Peck.....						

UNCOMPAHGRE PROJECT, COLORADO.

The dry weather which has continued since April 26 prevailed during July.

Work was continued on the excavation and installation of structures on several of the small laterals that have been taken over for operation by the service.

The uncollected water rentals due from the season 1921 on July 31 amounted to approximately \$5,200. The total cash collections to July 31 on account of water rentals for the season 1922 amounted to \$46,986.04.

The demand for irrigation water during the month was particularly heavy. The Gunnison Tunnel was shut down on July 1 and 2 in order to permit inspection of the concrete linings in the tunnel and along the South Canal. As a result, more cracks and holes along the canal were patched and 25 feet of additional floor was placed in the section between Drops 6 and 7 of the Seven-Drop section. A flow of 400 second-feet was turned back into the tunnel on July 3. This flow was increased to 500 feet on July 4, to 600 feet on July 5, to 800 feet on July 6, and to 900 feet on July 7.

The flow through the tunnel was maintained at 900 to 950 feet depending upon the stage of the Gunnison River until July 28, at which time failure was noted of part of the concrete wall section on the lower side of the canal at m. p. 6.05, at which time the tunnel was shut down and remained closed during the remainder of the month. It was found that a hole had been washed in the underlying shale to an average depth of 8 feet. In order to make the repairs it was necessary to haul 210 loads of rock to fill up the hole in the floor and under the right side wall. The concrete work was completed on August 1, and the tunnel gates were again opened on the morning of August 2. Seventy cubic yards of concrete were placed in completing the repair work.

The flow of the Uncompahgre River gradually decreased until during the latter part of the month only sufficient water was available in the river itself to supply priorities Nos. 1 to 24, inclusive. On account of the lack of rain and the hot weather which prevailed, the flow of the Uncompahgre and Gunnison Rivers was exceptionally clear, and as a result much loss resulted on account of evaporation and seepage. The flow available during the latter half of the month was only sufficient to furnish an 85 per cent head under a rotation plan of about six days on with one day off.

The P. & H. drag line completed the repairs of the Ashenfelter Hill, which was done for the county of Montrose. The machine was then moved to open up a drainage channel from Dolores Creek to Happy Canon Creek. This work was also being done for the county.—*L. J. Foster.*

BOISE PROJECT, IDAHO.

July was unusually hot. Labor was fully employed in the harvest fields, on highway, municipal improvements, railway, and miscellaneous construction. The wage scale remained about the same as the previous month.

During the latter part of the month grain harvesting and the second cutting of alfalfa were under way. A few fields of potatoes were dug, but owing to a light demand the price was low. A large acreage was prepared for head lettuce and seeding was well under way.

The flow of Boise River declined gradually from 4,597 second-feet on the 1st to 1,363 second-feet on the 31st. The total run-off for the month was 17 per cent below the mean for the 25-year period.

The demand for irrigation water was heavy, as all crops were using water. The hot weather caused a rapid growth of moss in the canals, which required a large amount of labor in removal. Several minor breaks occurred on the lateral system. On the 29th one joint of a 30-inch tile line on the Laht Drain collapsed and closed the drain, which caused the flooding of a small area of farm land. At the point where the failure occurred the drain is in a 30-foot cut. Forces were working day and night to open it up, but the work had not been completed at the end of the month. The Ruth excavator completed cleaning on the Lower Deer Flat Embankment Drain and then began cleaning the Deer Flat North Canal.

Work was begun the last of the month on erection of camp for the construction of the Black Canyon Diversion Dam on the Payette River and assembling of men and equipment for the work was under way.

Owing to the expenditure of all funds collected for the work the two drag-line excavators engaged in the excavation of the drainage system in the vicinity of

Wilder were laid up the latter part of the month.—*J. B. Bond.*

KING HILL PROJECT, IDAHO.

July weather was favorable for construction work. Government forces completed on the 25th the gunite wasteway at station 1375. Two engineering parties were engaged on lateral locations and surveys in connection with the proposed Bennett Creek Dam and Reservoir. The United States Bridge Co. under their contract finished pile driving in the south approach and started construction of timber and rock cribs for river piers of the Slick Bridge.

Considerable trouble was caused by moss, but enough was removed by drag harrow without turning out the water to enable the peak load to be carried. With the exception of two breaks in the canal, which were repaired in a day each, uninterrupted service was maintained.

The continued warm weather was extremely favorable for crop growth. Carload shipments of potatoes were made daily, although the demand was much lighter than ordinarily expected.

Project Manager Walter Ward has been assigned to the Black Canyon work and left the project July 22 for his new assignment.—*A. M. Rawns.*

MINIDOKA PROJECT, IDAHO.

July was unusually warm. The second cutting of alfalfa was begun, and the general condition of all crops was very good at the end of the month.

There was a heavy demand for water. At Station No. 1, on the South Side Pumping Division, more than 46,000 acre-feet were pumped.

Petitions for the formation of the American Falls Reservoir District were considered by the county commissioners of Twin Falls County and an election was set for August 28.

One survey party continued work on the Dubois project, running 72 miles of trial lines and 33 miles of levels.—*Barry Dibble.*

HUNTLEY PROJECT, MONTANA.

July weather was very favorable to crops; occasional showers and no excessive heat caused crops to mature readily and in fine condition.

The operation and maintenance forces were employed almost entirely in keeping the laterals free of weeds and grass. The Ruth machine was operated the entire month with good results.

The demand for water was heavy and continuous from July 5 to 25.—*A. R. McGinness.*

MILK RIVER PROJECT, MONTANA.

Temperature and precipitation for July were about normal, and the weather was reasonably good for construction, operation, and maintenance, and farming operations. Considerable damage was done by hail early in the month, and the grasshopper pest was becoming active. First cutting of alfalfa was completed, cutting of blue-joint hay commenced, and second cutting of alfalfa and grain harvest were about ready to begin. About 125 members of the National Editorial Association visited several project towns on the 29th. Labor supply was adequate during the forepart of the month, but with haying and harvesting coming on a shortage began to be apparent.

The contractor at Nelson Reservoir enlargement made fair progress but was somewhat delayed by breakdowns of his machinery. Seven earthwork contractors on lateral extensions in the vicinity of Beaverton and Glasgow made good progress and will

complete ahead of time. The contractor for structures on lateral extension in the vicinity of Saco and Glasgow moved in and commenced work.

Construction by Government forces included continuing excavation of waste-water ditch VW-1-3 near Glasgow with P. & H. drag line No. 121154, averaging 220 cubic yards per shift, and excavation of drainage ditch DN-D-1 near Dodson with P. & H. drag line No. 121162, averaging 136 cubic yards per shift.

Operation and maintenance included the operating of canals on the Malta and Glasgow Divisions for delivery of 2,700 acre-feet of water to 139 users on 5,000 acres of land. On the Chinook Division about 9,500 acre-feet of water were diverted from the river by the three irrigation district canals. The Ruth dredger operated two shifts per day, cleaning about 7 miles of laterals and waste-water ditches near Malta in the first 20 days of the month, after which it was shipped to the Glasgow Division, where it will operate for the balance of the season.—*Geo. E. Stratton.*

ST. MARY STORAGE.

July weather was favorable for the work being carried on.

Construction work was confined to rebuilding 1,150 linear feet of canal bank on the fifth mile of the St. Mary Canal.

At Sherburne Lakes Reservoir the gates were closed until the 17th, when they were opened to allow part of the normal flow of the creek to pass.—*R. M. Snell.*

SUN RIVER PROJECT, MONTANA.

Contractors have begun work on the construction of the lateral system for part 2 of the Greenfields Division. The earthwork contractors excavated about 6,500 cubic yards of material. The structures contractor placed a few turnouts and welrs and excavated for some checks.

The demand for water on the Fort Shaw Division was light during the first part of the month and heavy during the latter part. A maximum of 240 second feet was diverted into the Fort Shaw Canal, and rotation of deliveries was necessary during the peak load. On the Greenfields Division the demand was general and continuous and it was estimated that about 13,500 acres were being irrigated this season. It was necessary to draw on Willow Creek storage from July 22 to the end of the month.

Drainage studies on part 1 of Greenfields Division were continued and arrangements were made for transfer of a drag line from Riverton project for starting construction of an open drain.

The weather was slightly cooler than the average July. Grasshoppers and local hailstorms did some damage, but crops were generally in good condition. The first cutting of alfalfa had been harvested. Three cars of wheat were shipped from Fairfield and three cars of wool from Simms.—*Geo. O. Sanford.*

LOWER YELLOWSTONE PROJECT, MONTANA-NORTH DAKOTA.

July was cooler than usual and crops made satisfactory growth.

Work under contract 864 with J. E. Hilton has been completed. Contractors Beauchaine & Klug, under contract 878, made fair progress considering the labor situation. All the work under this contract is located from Sidney north. Contractor Gene Hoffstot, under contract 883, completed schedules 1 and 2 and moved his outfit to schedule 3. The construction of the Thomas Point pumping plant was practically com-

pleted. Water was pumped on the 9th of July and irrigation was carried on under the pumping unit during the remainder of the month. The construction of farm turnouts under the pumping unit and laterals under extension was carried on as needed by the water users.

Maintenance work consisted of repairing minor breaks, cleaning laterals of weeds, and repairing wooden structures. The Ruth ditch cleaner, after completing the work of removing silt from lateral KK, moved about 20 miles down the project and cleaned about 1 mile of laterals on the C system.

The immigration departments of the Northern Pacific and Great Northern Railroads were taking active part in securing settlers for the project, and from present indications many excess holdings will be farmed by new settlers in 1923.

Other than very slight damage by grasshoppers, all crops of the project were in excellent condition, although better returns from grain crops would have been obtained had irrigation been practiced.—*L. H. Mitchell.*

NEWLANDS PROJECT, NEVADA.

Unusually warm weather prevailed during a portion of July, making it necessary to use considerable water for irrigation.

The surface of Lahontan Reservoir fell below the spillway elevation on July 14. On July 11 it was necessary to open the Lake Tahoe outlet gates to satisfy power requirements on the Truckee River. The draft for this purpose was about 400 second feet at the end of the month.

On July 29 the rotation method of water delivery was commenced in the Truckee Division owing to the low stage of the Truckee River.

A somewhat serious break occurred in the T Line Canal, Soda Lake District, requiring the shutting out of water for several days.

The uncovering and repainting of the steel penstock to the Lahontan power plant was discontinued on July 8 pending definite plans for construction of a new penstock from Lahontan Reservoir.

Construction work on the lateral system was confined to a small amount of excavation and installation of six minor structures by Government forces in the Soda Lake District.

Excellent progress was made on the construction of deep open drains with six dragline excavators in operation.

The survey of areas upon which temporary suspension of water-right charges on account of seepage and alkali had been requested or in effect was practically completed during July.—*John F. Richardson.*

CARLSBAD PROJECT, NEW MEXICO.

July weather was hot and favorable for the growth of crops.

A total of 12,370 acre feet was delivered to the farms. The maximum capacity of the main canal was taxed severely. The growth of moss, particularly in the lower reaches of the canal above the concrete section, was extremely rapid. The maintenance force was busy at intervals in dragging the canal with a heavy chain and diskings the bottom. At the close of the month practically the entire cotton crop had been irrigated twice and part of it the third time. The cutting of the third crop of alfalfa was in progress at the close of the month. Maintenance work consisted of lateral cleaning throughout the project, repairing several minor breaks, and mowing opera-

tions in the main canal. An average force of about 10 men was employed on maintenance work.

The general condition of the crops on the project was excellent at the close of the month. Some slight damage was done by black rust appearing on the lower leaves of cotton plants. The condition of the cotton crop at the close of the month was estimated at about 85 per cent normal. A large percentage of the third crop of alfalfa was harvested; about 2,500 acres were left for seed, which appeared to be in good condition, with a promise of a good yield. The price of alfalfa hay advanced to \$12.50 per ton f. o. b. cars. The storage in the project reservoirs was considerably depleted at the close of the month. The available supply of water will be sufficient to last the project until about August 20.

Sydney D. Smith, plant quarantine inspector of the Department of Agriculture, visited the project July 7 in connection with fumigation of cotton seed and making plans for a general clean-up of cotton fields at the close of the present irrigation season.—*L. E. Foster.*

RIO GRANDE PROJECT, NEW MEXICO-TEXAS.

Construction work on drains and laterals with a small amount of work on flood protection continued in the Leasburg, Mesilla, and El Paso Divisions. In the Leasburg-Mesilla Division 10 shifts were being operated with 8 machines. Two Bucyrus 9½ drag lines and one Monighan 2-T excavated 94,800 cubic yards in 2 miles of drain. Two P. & H. and one Bucyrus 9½ drag-line machines excavated 32,300 cubic yards from 2 miles of lateral, and two Ruth ditching machines excavated 17,500 yards on 6.4 miles of lateral reconstruction.

In the El Paso Valley six shifts were in operation with five machines. Two Bucyrus 9½ and one Bucyrus 30-B drag lines excavated 62,600 cubic yards from 1.25 miles of drain. The Ruth ditching machine was used partly on maintenance and partly on lateral reconstruction, and the P. & H. resumed drain cleaning.

Irrigation water was released from Elephant Butte Reservoir throughout the month with a decrease in storage of 163,000 acre-feet. On the 21st the inflow at San Marcial ceased, and although reports of snow-fall in the upper drainage basin in the early spring were promising this is probably the driest year since 1913.

Cantaloupe shipments were in progress, and the pear crop, which was somewhat better than expected, was being packed and shipped.

R. B. Enriquez, of Chihuahua, Mexico, engineer in charge of a proposed irrigation project estimated to cost \$15,000,000 on the Concha and San Pedro Rivers, visited the project office to obtain information as to disposition of water and settlement of lands. Mr. Enriquez is a brother to I. C. Enriquez, the governor of the State of Chihuahua.—*L. M. Lawson.*

NORTH DAKOTA PUMPING PROJECT.

Owing to heavy rains the latter part of June, there were no pumping operations during the first 13 days of July.

The power plant was operated continuously for irrigation and for the commercial power contract. For commercial power 75,650 kilowatt hours of electrical energy were generated, which was within 500 kilowatt hours of the amount generated in the same month last year.

One thousand two hundred and forty-six tons of coal was mined.—*Wm. S. Arthur.*

UMATILLA PROJECT, OREGON.

High temperatures with no rainfall caused heavy demand for water.

The second cutting of alfalfa was harvested. Diggings and shipping of early potatoes were general. A considerable amount of baling and shipping of hay took place. Barley, wheat, and oats were threshed.

All available local labor was employed. Although the service was not engaged in extensive construction work, it was with difficulty that the necessary force to do the work under way efficiently was maintained.

All canals and laterals for distribution were operated heavily. Small crews were engaged on maintenance work on both divisions, largely on the removal of weeds and the dragging of canals to remove the growth of moss.

One crew was employed on lateral extension work; 1,500 cubic yards of material were excavated; 2,440 linear feet of 16-inch and 2,600 linear feet of 12-inch concrete pipe were laid and 10 minor structures were built; 430 linear feet of 8-inch, 820 linear feet of 10-inch, 600 linear feet of 12-inch, and 2,054 linear feet of 16-inch concrete pipe were manufactured.

Some very good yields of wheat, oats, barley, and potatoes were reported, which is encouraging in view of the increased tendency toward diversification of crops. During the month the beekeepers' association held a meeting at which the price of honey was set at 10½ cents f. o. b. Hermiston.—*H. M. Schilling.*

KLAMATH PROJECT, OREGON-CALIFORNIA.

July was hot and dry. The demand for water was fairly consistent until toward the end of the month, when the demand increased considerably. Haying was started early in July and continued throughout the month. In general the first cutting of alfalfa hay was about two weeks later than usual. A part of the hay crop was damaged by rain on July 19. On the dry farms considerable grain was being cut for hay, as there was not sufficient moisture to mature the grain crops.

In the Tule Lake Division work was continued on the construction of the lateral system. Advertisements were being made for bids for building the structures for the lateral system for an area of about 7,500 acres. Contracts have been let for all of the canal structures north of the Oregon-California boundary. The contractor had a fair-sized crew organized and began work early in August. The canal structures will be of concrete; the lateral structures will be principally constructed of timber.

For the Langell Valley Division, advertisement was being made inviting bids for constructing the West Side Canal, involving the excavation of about 190,000 cubic yards of material. Bids will be opened on August 31. For the Diversion Dam on Lost River the cofferdams have been constructed. Early in August the site will be unwatered and work will begin on excavating for the foundation.—*Herbert D. Newell.*

BELLE FOURCHE PROJECT, S. DAK.

July weather was favorable for growing crops, but rains interfered seriously with the alfalfa harvest and little hay was put up in first-class condition. A severe hailstorm swept across the northern portion of the project on July 8, covering a strip 5 miles wide by 18 miles long. Crops were completely destroyed over a portion of the area.

Winter wheat harvest began the middle of the month and spring wheat began to mature about 10 days later. Indications pointed to an average yield of about 25 bushels. Small grains generally will be harvested without irrigation and present moisture in the ground will be sufficient to mature most of the corn crop. Sugar beets and potatoes continue to make fine growth. The second cutting of alfalfa began the last week of the month.

Wasting from the reservoir continued throughout the month and resulted in lowering the water surface 3.6 feet, making a total reduction of 6.3 feet since the maximum of May 12. Accretion from surface run-off continued heavy and totals nearly 40,000 acre feet for the past three months. There was practically no demand for irrigation water other than few scattering deliveries for alfalfa and grains, mostly on the lighter soils. The Inlet Canal was not operated except to supply a few farms under the Johnson Lateral.

The small laterals as a rule have become choked with weeds because of nonuse and ditch riders were busy nearly the entire month in removing the rank growth in anticipation of alfalfa irrigation in August. The Baby Ruth cleaned 5.9 miles of laterals during the month and moved about 6,620 yards of earth.—*F. C. Youngblutt.*

Summary of employees for July, 1922.

	Begin- ning of month.	End of month.	In- crease.	De- crease.
PROJECT OFFICES.				
Washington office.....	78	77	.....	1
Denver office.....	59	59	.....	.....
Field legal.....	1 18	1 18	.....	.....
Examiners of accounts.....	3	3	.....	.....
Yuma.....	165	121	.....	44
Yuma auxiliary.....	38	17	.....	21
Orland.....	27	29	2	.....
Grand Valley.....	38	38	.....	.....
Uncompahgre.....	85	127	42	.....
Boise.....	180	155	.....	25
King Hill.....	64	72	8	.....
Minidoka.....	97	95	.....	2
Huntley.....	58	61	3	.....
Lower Yellowstone.....	42	32	.....	10
Milk River.....	67	64	.....	3
St. Mary storage (including one-half time of 7 on Blackfeet).....	23	21	.....	2
Sun River.....	41	40	.....	1
North Platte.....	388	360	.....	28
Newlands.....	122	130	8	.....
Carlsbad.....	24	24	.....	.....
Rio Grande.....	326	308	.....	18
North Dakota pumping.....	47	48	1	.....
Klamath.....	103	130	27	.....
Umatilla.....	50	45	.....	5
Belle Fourche.....	38	37	.....	1
Strawberry Valley.....	26	19	.....	7
Okanogan.....	39	34	.....	5
Yakima.....	125	120	.....	5
Tieton Dam.....	505	522	17	.....
Riverton.....	107	90	.....	17
Shoshone.....	224	298	74	.....
INDIAN.				
Flathead.....	131	125	.....	6
Fort Peck.....	13	9	.....	4
Blackfeet (including one-half time of 7 on St. Mary storage).....	45	23	.....	22
Secondary.....	24	29	5	.....
Unassigned per diem.....	26	26	.....	.....
Total employees.....	3,446	3,406	.....	.....
Increase.....	.....	.....	187	.....
Decrease.....	.....	.....	.....	227
Net decrease.....	.....	.....	.....	40

¹ Exclusive of 3 in Denver office.

STRAWBERRY VALLEY PROJECT, UTAH.

July was unusually warm and dry and the demand for irrigation water was heavy. Sand deposits in the High Line Canal interfered to some extent with water deliveries to the High Line Division and reduced the maximum flow from 250 to 215 second-feet.

Picking of early apples and peaches had begun and the grain crop was about ready to harvest. The second stand of alfalfa was only fair, and the sugar-beet crop was below the average, both in quantity and quality. Continued hot weather and attacks of locusts and grasshoppers injured the grain to some extent.

Delivery of stored water from Strawberry Reservoir continued without interruption during the month and a total of 21,100 acre-feet of water released through Strawberry Tunnel. A total of 37,480 acre-feet of water was delivered to the headgates of the several project canals. Of this amount 14,245 acre-feet were derived from Spanish Fork River and delivered to the several canal companies under the Spanish Fork Division. During the month the High Line Division received 11,654 acre-feet, the Spanish Fork Division 22,359 acre-feet, and the Mapleton and Springville Irrigation Districts 3,467 acre-feet.

The project power plant was in continuous operation, delivering under contract 107,858 kilowatt hours to the several project towns.—*W. L. Whittemore.*

OKANOGAN PROJECT, WASHINGTON.

July weather was extremely hot. The loss in storage during the month was 4,220 acre feet, and there were available for use in Conconully Reservoir at the end of the month 4,675 acre feet with water $1\frac{1}{2}$ feet below the gate sill at Salmon Lake. The amount of water in storage at the beginning of the month with the canals run at 80 per cent capacity will carry the project to the 1st of September. Additional pumping from Salmon Lake will, no doubt, make 15 or 20 days more available after that date.

The gravity system was operated with only one 24-hour interruption which came from a bad leak on the upper main lateral, where the break of the previous month occurred, and which was repaired during the daylight hours, the upper main lateral being the only part of the system affected by this shutdown. One other small leak at a point where a break was had last year, started but was stopped in a few hours by puddling the canal bank. The mechanical force was engaged in erecting and starting the Salmon Lake pumping plant, one unit of which was completed and started on July 17; the other unit was within a few days of completion at the end of the month.—*Calvin Casteel.*

YAKIMA PROJECT, WASHINGTON.

Sunnyside Division.—Operation was continuous throughout July, the maximum diversion being 1,306 second feet, with an average of 1,292. Deliveries were cut to July schedule early in the month. The demand for water was heavy and steady. Water delivery to the irrigation districts was continuous except for short delays for minor repairs.

Tieton Division.—The main canal was operated continuously with the exception of a 2-hour interruption caused by the tripping of a spillway. Unit 3 was without water for three hours due to a leak in one of the metal flumes. The average diversion was 321 second feet. Maintenance was confined to mowing weeds and cleaning moss in the sublateral system and repairs to small structures, pipes, and flumes.

Storage reservoirs.—Storage was released July 1 at Kachess and Keechelus, on July 10 at Cle Elum, and at Bumping Lake on the 19th, the total release being 149,798 acre feet. River regulation was good and no shortage occurred. Total waste over the Sunnyside Dam was 31,736 acre feet.—*J. L. Lytel.*

TETON DAM.

July weather conditions were excellent for construction. The road to Naches remained in good condition in spite of a large amount of traffic. An average force of 520 men was employed. Labor was scarce and the turnover large.

One thousand three hundred and twenty cubic yards of concrete were placed in the core wall and 109,000 cubic yards of embankment were placed in the dam. Dumping was completed on the first lift, elevation 2775, and equipment was moved and dumping commenced on the second lift, elevation 2805.—*F. T. Crowe.*

RIVERTON PROJECT, WYOMING.

On the Second Division of the Wyoming Canal drag line 121474 was operated two shifts up to July 12, completing the excavation to Station 552, moving 4,485 cubic yards, all of which was sandstone.

On the Wind River Diversion Dam the pouring of concrete in the headworks, sluiceway, and logway was completed; 311 cubic yards of concrete were placed and the forms for this part of the structure were removed; 225 cubic yards of trimming was done for the transition structure below the headworks. Drag line 121322 rediverted the river into its temporary channel on July 27, and resumed the excavation for the spillway structure, moving 5,521 cubic yards.

That portion of the dike at the diversion dam south of the temporary river channel was completed on July 24. Drag line 121323 loaded 14,675 cubic yards on wagons for this embankment. This work will be completed later in the season.

Drag line 121474 was moved to the Pilot Butte Reservoir site on July 13 and began the excavation of the outlet trench for that reservoir, moving 22,719 cubic yards, about 8 per cent of which was soft sandstone.

One party was employed on topographic surveys.—*H. D. Comstock.*

SHOSHONE PROJECT, WYOMING.

The first week of July was unusually cool. The Shoshone River was receding from the flood stage of June at a moderate rate. At the close of the month the water supply was still sufficient for all appropriators.

At Shoshone Power Plant the roof extension and the placing of the rock back fill on the power-house roof and roof extension were completed. At the Willwood Dam the construction of the camp had progressed to the point where a mess had been established. The road into camp was also completed. The temporary 33,000-volt transmission line and substation at the dam were erected and practically completed, and work with a class 14 electric drag line on Willwood Canal and Willwood Dam site excavation will be begun during the fore part of August. On the Garland Division drainage construction was continued with a class 9½ gas drag line, a class 9½ electric drag will be begun during the fore part of August. On the Frannie Division similar work was prosecuted with two class 9½ electric drag lines and a class 14 gas

drag line and a ½ cubic yard gas drag line. These various machines excavated 208,000 cubic yards of material during the month.

The irrigation systems of the Garland and Frannie Divisions were in operation the entire month. The principal difficulty encountered was with moss growths. Six of the principal laterals were dragged four times each in the last half of the month, in order to permit satisfactory water deliveries.—*J. S. Longwell.*

INDIAN PROJECTS, MONTANA.

BLACKFEET PROJECT.

During the early part of July there were several showers on the irrigated area and one heavy rain-storm which furnished sufficient water, so that most water users did not consider that their crops needed irrigation. The latter part of the month was favorable for crop growth.

Construction work was confined to Four Horns Reservoir Outlet Canal, where a small amount of canal excavation was done with Indian teams and a Monighan drag line, and where work was started on one drop.

Four divisions of the project were operated. A total of 4,412 acres was irrigated, and 2,888 acre-feet of water were delivered to farmers.

Most of the crops were in very good condition, the indications being that the crop returns on the whole will be satisfactory. On the extreme eastern part of the project some crops were damaged by hail, and on the southeastern portion considerable damage was done by grasshoppers.—*R. M. Snell.*

FLATHEAD PROJECT.

July weather conditions were normal. The run-off of all creeks took a decided drop during the month and threatened to limit the supply for the Camas and Mission Valley Divisions.

At the Hubbard Dam, stripping of the west side of the river was carried on with fair progress. Pumping equipment was received for unwatering the dam site and a guy derrick was put in condition to assist in stripping operations. Machinery was assembled for operating air drills on the rock excavation for the base of the dam and the construction of a machine shop was begun.

On the Tabor Feed Canal the Bucyrus steam shovel began excavation for a road leading out from Tabor Reservoir. The shovel moved a distance of 7 miles and excavated 7,321 cubic yards class 1, 2, and 3 material, working one shift. Clearing of a 30-foot road right of way through thick timber was completed for a distance of 8,500 feet. Part of this timber provided fuel for the steam shovel.

Operation and maintenance forces delivered 14,225 acre-feet of water for the irrigation of about 15,000 acres. Two small breaks occurred on the Camas Division making it necessary to have water out of a part of the laterals two days. Several sink holes broke through on the Pablo subdivision.

One survey party did location and cross-section work on the Tabor Feed Canal and on miscellaneous lateral extensions of the Mission Valley Division. Labor conditions became serious after the middle of the month on account of the demand for harvest hands and for men in lumber camps.

Harvesting of winter wheat became active after the middle of the month with fair crop yields. Threshing of this crop was in full progress. Cutting of the

second crop of alfalfa was in progress at the end of the month.—*C. J. Moody.*

FORT PECK PROJECT.

July weather was favorable both for crop growth and field work.

Canals were operated on Big Muddy, Poplar, Little Porcupine, and Big Porcupine Divisions, but little new acreage was irrigated.

Maintenance work consisted of burning weeds, repairs to minor wooden structures, and clearing canals of water growth.

Construction consisted of back filling concrete structures on Big Muddy Division. Crop prospects were fair, and live stock conditions good.—*E. L. Decker.*

GENERAL OFFICES.

Washington office.—Director Davis was in the office until the latter part of the month, leaving for an extended western trip on July 26. After spending a

few days in Denver for consideration of the appropriation estimates for the fiscal year 1924 and other business, he planned to visit various points on the North Platte River, going thence to Idaho and Oregon. Later he expected to visit a number of other projects and go down the Colorado River from Halls Crossing to Lees Ferry with a party arranged by the Geological Survey for an examination of the dam sites in that stretch of the river. During his absence the office is in charge of Assistant Director Morris Bien as acting director.

Mr. Bien was away from the office for a few days in July attending a meeting in Chicago of the American Association of Engineers.

Chief Counsel Hamele left for a western trip on July 28.

During the month the director appeared before the Senate Committee on Irrigation, by request of Senators Poindexter and Jones, during the consideration of the bill to appropriate \$100,000 for the survey of the Columbia Basin project. This bill was favorably

Comparison between operation and maintenance estimates and results, January 1 to July 31, 1922.

Project.	Gross cost.				Net accruals and revenues.				Area for which water is available.
	Estimate for 1922.		Actual cost to July 31.	Amount * over or under.	Estimate for 1922.		Actual returns to July 31.	Amount more or * less than estimate.	
	Total for year.	To July 31.			Total for year.	To July 31.			
UNDER PUBLIC NOTICE.									
Belle Fourche.....	\$70,000	\$36,500	\$35,000	\$1,500	\$101,153	\$62,000	¹ \$62,000	-----	\$82,500
Boise.....	290,000	168,000	148,000	20,000	290,000	214,000	² 175,000	*\$39,000	167,300
Carlsbad.....	52,000	29,500	35,500	*6,000	56,625	39,000	33,000	*6,000	25,000
Huntley.....	45,000	28,500	27,500	1,000	46,500	25,500	16,500	*9,000	30,000
King Hill.....	35,500	15,500	18,500	*3,000	*35,500	15,500	18,500	3,000	16,900
Klamath.....	55,000	40,500	28,500	12,000	*55,000	40,500	28,500	*12,000	51,000
Lower Yellowstone.....	36,000	24,000	15,000	9,000	*36,000	24,000	15,000	*9,000	40,200
Minidoka (South Side).....	94,000	54,000	44,000	10,000	95,300	47,500	58,000	10,500	49,000
Newlands.....	105,000	65,000	76,000	*11,000	121,000	58,000	102,000	14,000	72,200
North Dakota pumping.....	35,000	21,600	18,000	3,600	*30,820	20,000	20,000	-----	7,650
North Platte (Interstate).....	165,000	118,000	98,000	20,000	166,700	78,000	73,000	*5,000	*130,000
Okanogan.....	37,000	24,000	28,200	*4,200	*53,720	40,720	44,920	4,200	8,460
Orland.....	35,000	22,000	17,000	5,000	35,230	23,500	23,500	-----	20,500
Rio Grande.....	231,000	161,000	149,000	12,000	*233,945	163,945	151,945	*12,000	116,000
Shoshone.....	70,000	39,200	37,500	1,700	75,750	53,000	46,500	*6,500	71,100
Strawberry Valley.....	*25,000	14,500	14,000	500	*52,500	19,300	20,800	1,500	59,100
Sun River (Fort Shaw).....	14,000	12,400	9,800	2,600	15,600	10,600	10,600	-----	13,900
Umatilla.....	37,280	22,000	21,600	400	*37,280	22,000	21,600	*400	24,400
Yakima.....									
Sunnyside.....	130,000	73,000	75,000	*2,000	148,776	95,000	100,000	5,000	103,000
Tieton.....	84,000	47,000	50,000	*3,000	89,500	58,000	55,000	*3,000	32,000
Yuma.....	260,000	172,000	169,000	3,000	262,000	180,000	160,000	*20,000	63,200
Total.....	1,905,780	1,188,200	1,115,100	73,100	2,039,199	1,320,065	1,236,365	*\$83,700	1,183,410
UNDER WATER RENTAL.									
Grand Valley.....	50,000	31,000	29,400	1,600	50,800	33,500	32,500	*1,000	38,400
Milk River (including St. Mary).....	71,500	43,300	33,800	9,500	22,000	18,700	18,000	*700	*74,000
North Platte (Fort Laramie).....	70,000	43,000	34,500	8,500	53,000	29,000	36,000	7,000	43,400
Sun River (Greenfields and Big Coulee).....	25,000	20,000	14,600	5,400	30,000	24,000	24,000	-----	28,500
Uncompahgre.....	135,000	80,000	96,000	*16,000	142,500	55,000	47,000	*8,000	100,000
Total.....	351,500	217,300	208,300	9,000	298,300	160,200	157,500	*2,700	284,300
INDIAN.									
Blackfeet.....	30,000	19,000	11,500	7,500	19,700	18,000	6,000	*12,000	21,500
Flathead.....	65,000	37,000	31,000	6,000	58,000	40,000	28,500	*11,500	105,000
Fort Peck.....	14,600	9,200	9,200	-----	1,000	400	400	-----	22,400
Total.....	109,600	65,200	51,700	13,500	78,700	58,400	34,900	*23,500	148,900

¹ Based on minimum charge.

² Estimated by Denver office. Figure not shown on project chart.

³ Returns regulated by district contract.

⁴ Includes 17,000 acres for which water is carried in main canal.

⁵ Not including tunnel repairs.

⁶ Includes installment of \$25,000 for tunnel repairs.

⁷ Stored water is furnished through the St. Mary Canal for 21,600 acres additional.

reported to the Senate on July 11 and passed the Senate as reported. It provides an appropriation of \$100,000 to be expended by the Secretary of the Interior, and report is required on or before January 1, 1924.

A number of tables and diagrams were prepared in connection with the article in the July RECLAMATION RECORD, continuing the summary of 20 years of reclamation.

Up to the end of July 1,394 applications for relief had been filed by water users under the act of March 31, 1922. On the basis of 33,000 water users on the projects of the service, this represents only 4.2 per cent.

Action was taken by the Secretary on the following matters, among others, submitted to him:

Recommending approval of the draft of contract with the Zillah Irrigation District, Yakima project, providing for the delivery of 324.06 acre-feet of water at a net cost of \$4,092.38; approved July 22.

Recommending the execution of a contract with the Salt River Valley Water Users Association, which provides for payment to the United States of the cost of supervisory management of the project, makes assignment of power revenues to secure payment of construction charges, extends payment of certain delinquent charges, providing, however, for full payment of all charges due by December 31, 1923, approves the general plan for additional electrical energy on the project, and adjusts differences relating to water rights on the Salt River Indian Reservation; approved July 26.

Among the visitors to the Washington office during the month were Mr. Seiki Morisawa, instructor in the Agricultural and Forestry College, Tsu, Japan; and Dr. Ildefonso Albano, Fortaleza, Brazil.

During the month 154 purchase orders were placed, 6 advertisements issued, and 84 referred to the General Supply Committee. Purchases amounted to \$6,691.26. The storehouse filled 169 requisitions and made 11 sales from stock, the total value amounting to \$1,743.34.

Publications issued during the month comprised 53 copies of the annual report and 420 miscellaneous publications. The 23 mimeograph jobs amounted to a total run of 21,870 sheets.

The settlement and information section answered 361 inquiries concerning the service and opportunities on the projects. At the end of the month the total number of inquiries from ex-service men concerning opportunities on the land amounted to 193,880.

The photographic laboratory turned out work during the month to the value of \$407.10, distributed as follows: Washington office, \$265.05; field, \$136.40; sales, \$5.65.

The work of the office was current.

Denver office.—The chief engineer left Denver on July 9 for the Riverton and Shoshone projects, returning on July 17. He left again on July 30 for the North Platte project. Assistant Chief Engineer Chas. P. Williams was in the field at the beginning of the month and during July visited the Baker and Flathead projects, returning to Denver on July 12. Engineer James Munn was in the field at the beginning of the month and during July visited the Baker, Boise, Strawberry Valley, Grand Valley, and Uncompahgre projects, returning to Denver on July 13.

The principal work in the designing section consisted of the following: Revised designs were prepared for Hubbard Dam; began preliminary designs for Grand River Crossing, Orchard Mesa; detail

designs were prepared for five siphons, King Hill project; revised design for flume over Lost River, Klamath project; completed designs for two checks, Lower Yellowstone project; studying lay-out of drainage system for Middle Rio Grande Valley; completed designs for spillway and wasteway, Milk River project; completed designs for siphon on Horse Creek Lateral and radial sluice gate for Horse Creek Diversion Dam, North Platte project; prepared designs for various structures on Wyoming Canal, Riverton project; prepared designs for roadway and right abutment, Wind River Diversion Dam, Riverton project; completed detail design for Willwood Diversion Dam, Shoshone project; partially prepared designs for repairs to Spanish Fork Diversion Dam and Upper Plunge Basin, Strawberry Valley project; prepared review of report on proposed Roza Division, Yakima project.

The principal work in the electrical section consisted of the following: Prepared preliminary design of power and pumping plant at Black Canyon Diversion Dam, Boise project; completed design of outlet works at Hubbard Dam, Flathead project; tested pumping equipment, Lower Yellowstone project; prepared designs and estimates for permanent repairs to south tunnel outlet, North Platte project; prepared specifications for electrical equipment for plant at Willwood Dam, Shoshone project; completed design for emergency gates, Tieton outlet works, Yakima project; completed specifications for electrical apparatus for enlargement of Valley drainage plant, Yuma project.

The cost and property section arranged transfers of equipment and materials, amounting to \$1,843; sales to private parties amounted to \$641.

The more important matters considered by the legal section were the furnishing of water from Lahontan Reservoir to the Canyon Power Co., the payment of drainage assessments against property of the United States, Yakima project, and the disposal of relinquished farm units on the Yuma auxiliary project.

An average of 409 letters per day were received and handled in the mails and files section; the disbursing section handled 881 vouchers, involving an expenditure of \$148,244.83; and in the purchasing section 356 advertisements were issued, and 376 vouchers involving an expenditure of \$83,581.63 were prepared.—*R. F. Walter.*

Radio on the Salt River Project, Arizona.

The Salt River Valley Water Users' Association has installed a radio broadcasting service in connection with the operation of the project. Gauges are placed in the upper Verde and also at Cave Creek, so that any appreciable rise of water caused by sudden storms can be noted and broadcasted from the station to the manager's office in Phoenix and to all ranch owners who listen in, thus providing a timely warning and preventing great damage. The inlet from the reservoir at Roosevelt Dam will also be controlled by telephone from Phoenix, based on reports from the radio station; thus it will be closed when there is a sufficient water supply and opened when the water in the river is low. In this way much of the storage supply will be conserved for use in emergency.

ADMINISTRATIVE ORGANIZATION.

DEPARTMENT OF THE INTERIOR.

HON. ALBERT B. FALL, Secretary of the Interior.
 EDWARD C. FINNEY, First Assistant Secretary.
 FRANCIS M. GOODWIN, Assistant Secretary.
 EDWIN S. BOOTH, Solicitor for the Interior Department.
 CHARLES V. SAFFORD, Administrative Assistant to the Secretary.
 MORGAN R. BROCK, Assistant to the Secretary.
 HARRY G. CLUNN, Private Secretary to the Secretary.
 JOHN HARVEY, Chief Clerk and Superintendent of Buildings.

U. S. RECLAMATION SERVICE.

WASHINGTON, D. C.

Arthur Powell Davis, director; Morris Blen, assistant director; Otthar Hamele, chief counsel; J. B. Beadle, director's assistant; C. J. Blanchard, statistician; Hugh A. Brown, editor and office assistant; C. A. Bissell, engineer; J. M. Luney, chief accountant; C. A. Lyman, repayment accounting; Miss H. A. Fellows and Raymond Depue, fiscal agents; C. H. Fitch, chief clerk; Emmet Carr, purchasing agent; G. W. Numbers, appointment clerk; H. N. Bickel, Yakima, Wash., and W. F. Kubach, Great Falls, Mont., examiners of accounts.

DENVER, COLO.

F. E. Weymouth, chief engineer, Tramway Building, Denver, Colo.; R. F. Walter and C. P. Williams, assistant chief engineers; Miss L. H. Meisel, secretary to the chief engineer; J. M. Gaylord, electrical engineer; J. L. Savage, designing engineer; James Munn, engineer; W. A. Meyer, chief clerk; A. McD. Brooks, purchasing agent; Harry Caden, fiscal agent

FIELD LEGAL OFFICES.

Boise, Idaho.—B. E. Stoutemyer, district counsel. Projects: Boise, Minidoka, King Hill, and Jackson Lake Enlargement;

Denver, Colo.—Law section office of chief engineer: R. M. Patrick and Armand Offutt, district counsel.

El Paso, Tex.—P. W. Dent, district counsel. Projects: Rio Grande, Carlsbad, and Hondo.

Las Cruces, N. Mex.—Mark B. Thompson, attorney in charge of litigation on Rio Grande and Carlsbad projects.

Helena, Mont.—E. E. Roddis, district counsel, Helena, Mont. Projects: Blackfeet, Flathead, Fort Peck, Huntley, Milk River, St. Mary Storage, Sun River, North Dakota Pumping, Lower Yellowstone, and Shoshone.

Mitchell, Nebr.—J. N. Beardslee, district counsel. Projects: North Platte, Belle Fourche, and Riverton.

Montrose, Colo.—J. R. Alexander, district counsel. Projects: Grand Valley, Uncompahgre, and Strawberry Valley.

Portland, Oreg.—H. L. Holgate and D. G. Tyree, district counsel. Projects: Yakima, Okanogan, Umatilla, and Klamath.

San Francisco, Calif.—Henry A. Cox and Brooks Fullerton, district counsel, 349 Pacific Building. Projects: Salt River, Yuma, Orland, and Newlands.

PROJECT ORGANIZATION.

Baker Project.—C. C. Fisher, project manager, Baker, Oreg.; E. V. Hillus, chief clerk.

Belle Fourche Project.—B. E. Hayden, project manager, Newell, S. Dak.; R. C. Walber, chief clerk.

Boise Project.—J. B. Bond, project manager, Boise, Idaho; Walter Ward, engineer in charge construction Black Canyon Dam; E. R. Mills, chief clerk; C. F. Weinkauff, fiscal agent.

Carlsbad Project.—L. E. Foster, project manager, Carlsbad, N. Mex.; V. L. Minter, chief clerk and fiscal agent.

Grand Valley Project.—S. O. Harper, project manager, Grand Junction, Colo.; C. H. Young, chief clerk; A. H. Hall, fiscal agent.

Huntley Project.—A. R. McGinness, project manager, Ballantine, Mont.; G. H. Bolt, chief clerk; Miss M. C. Simek, fiscal agent.

King Hill Project.—A. M. Rawn, project manager, King Hill, Idaho; T. W. Hause, chief clerk.

Klamath Project.—H. D. Newell, project manager, Klamath Falls, Oreg.; N. G. Wheeler, chief clerk; G. R. Barnhart, fiscal agent.

Lower Yellowstone Project.—L. H. Mitchell, project manager, Savage, Mont.; C. A. Denman, chief clerk.

Milk River Project.—G. E. Stratton, project manager, Malta, Mont.; H. A. Parker, engineer; E. E. Chabot, chief clerk; G. S. Moore, fiscal agent.

Minidoka Project.—Barry Dibble, project manager, Burley, Idaho; Dana Templin, engineer; E. C. Diehl, chief clerk; Miss A. J. Larson, fiscal agent; F. A. Banks, engineer, American Falls, Idaho.

Newlands Project.—J. F. Richardson, project manager, Fallon, Nev.; A. W. Walker, engineer; G. B. Snow, chief clerk; Miss Ethel M. Simmonds, fiscal agent.

North Dakota Pumping Project.—W. S. Arthur, project manager and chief clerk, Williston, N. Dak.; H. C. Melaas, fiscal agent.

North Platte Project.—Andrew Weiss, project manager, Mitchell, Nebr.; H. W. Bashore, engineer, Fort Laramie Division; Paul Rothi, irrigation manager; J. R. Ummel, chief clerk; Miss A. L. Perrine, fiscal agent.

Okanogan Project.—Calvin Casteel, project manager, Okanogan, Wash.; W. D. Funk, chief clerk and fiscal agent.

Orland Project.—R. C. E. Weber, project manager, Orland, Calif.; E. T. Eriksen, engineer; C. H. Lillingston, chief clerk and fiscal agent.

Rio Grande Project.—L. M. Lawson, project manager, El Paso, Tex.; T. W. Parry, irrigation manager; C. A. Peavey, chief clerk; L. S. Kennicott, fiscal agent.

Riverton Project.—H. D. Comstock, project manager, Riverton, Wyo.; R. M. Conner, engineer; G. H. Murphy, chief clerk; Miss Grace M. McCarthy, fiscal agent.

St. Mary Storage Division.—R. M. Snell, project manager, Brown- ing, Mont.; F. H. Shiner, chief clerk and fiscal agent.

Salt River Project.—Being operated by the Salt River Valley Water Users' Association; C. C. Cragin, general superintendent and chief engineer, Phoenix, Ariz.

Shoshone Project.—J. S. Longwell, project manager, Powell, Wyo.; J. R. Iakisch, engineer; C. M. Jump, superintendent of irrigation; W. F. Sha, chief clerk; Miss L. C. Drinkwater, fiscal agent.

Strawberry Valley Project.—W. L. Whittemore, project manager, Provo, Utah; J. E. Overlade, chief clerk and fiscal agent.

Sun River Project.—G. O. Sanford, project manager, Great Falls, Mont.; H. W. Johnson, chief clerk; Miss M. G. Valentine, fiscal agent; G. A. Benjamin, irrigation manager, Fairfield, Mont.

Umatilla Project.—H. M. Schilling, project manager, Hermiston, Oreg.; G. C. Patterson, chief clerk and fiscal agent.

Uncompahgre Project.—L. J. Foster, project manager, Montrose, Colo.; R. B. Smith, chief clerk.

Yakima Project.—J. L. Lytel, project manager, Yakima, Wash.; R. K. Cunningham, chief clerk; J. C. Gawler, fiscal agent; M. D. Scroggs, superintendent of irrigation, Sunnyside, Wash.; J. S. Moore, superintendent of irrigation, Route 6, Yakima, Wash.; F. T. Crowe, engineer in charge construction Tieton Dam, Rimrock, Wash.; C. F. Gleason, engineer; V. G. Evans, chief clerk; C. B. Funk, fiscal agent.

Yuma Project.—P. J. Preston, project manager, Yuma, Ariz.; R. M. Priest, superintendent of construction; S. A. McWilliams, engineer, Yuma Mesa Division; E. R. Scheppelmann, chief clerk; E. M. Philebaum, fiscal agent.

INDIAN PROJECTS.

Blackfeet Project.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk and fiscal agent.

Flathead Project.—C. J. Moody, project manager, St. Ignatius, Mont.; S. A. Kerr, engineer in charge construction Hubbard Dam; J. M. Swan, chief clerk; J. P. Siebeneicher, fiscal agent.

Fort Peck Project.—E. L. Decker, acting project manager, Poplar, Mont.; Henry Berryhill, chief clerk and fiscal agent.

The Reclamation Record

A PUBLICATION IN THE INTEREST OF THE WATER USERS.

Issued Monthly by the RECLAMATION SERVICE, DEPARTMENT OF THE INTERIOR, Washington, D. C.

CERTIFICATE: The publication of the periodical entitled The Reclamation Record is necessary in the transaction of the public business required by law of the Reclamation Service, Department of the Interior.

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GOOD NEWS FOR RECLAMATION RECORD READERS.

AS OUR readers know, the Reclamation Record has been issued since the first of the year in the form of an administrative and statistical report—the only form in which it could be issued under the regulations of the Congressional Joint Committee on Printing. In this form the Record continued to serve a very useful purpose, but its value to the water users was curtailed because of the limitations placed on the character of the material which could be printed under the regulations of the committee. Our readers in general have missed the optimistic articles by Statistician Blanchard under the caption of "Current comments." The women on the projects have looked in vain for the articles by Mrs. Littlepage. The "Hints from practical farmers" also were thrown temporarily into the discard. Many other highly interesting articles from the pens or typewriters of the water users themselves could not be used in a strictly administrative and statistical report.

Beginning with the present issue, however, the situation offers bright promise for the future. Public Resolution No. 57, approved May 11, 1922, provides that magazines such as the Reclamation Record may be issued with the approval of the head of the proper department and also the approval of the Director of the Budget.

On August 14, 1922, the Director of the Budget issued Circular No. 78, quoting Public Resolution No. 57, and requesting certain information concerning Government periodicals from which he might be in a position to decide whether the printing of such publications should be authorized. This circular was answered by Secretary Fall with a strong recommendation for the publication of the Record in substantially the form in which it appeared prior to January, 1922, and prompt approval of the recommendation was given by the Director of the Budget.

The circular contains the following limitations on the character of the material which may be published in future:

"Periodicals shall be devoted exclusively to the work which the organization unit of the Government issuing the same is required by law to undertake, and shall not contain any matter relating to work which any other unit of the Government performs, or is authorized to perform, or any matter not necessary in the transaction of the public business as required by law. Periodicals will not contain articles intended solely to foster and maintain interest in a Government agency, or the interest and morale of Government employees. Periodicals will not contain editorials, book reviews, and articles which can be construed as propaganda in favor of increased appropriations or legislation.

"No illustrations, photographs, engravings, or drawings will be used in periodicals unless they relate solely to the public business and are necessary to a clear understanding of the subject matter contained therein. No periodicals will contain any advertisement inserted by or for any private individual, firm, or corporation."

With the above limitations, the Reclamation Record will endeavor to continue to merit the approval of the water users on the projects and our other readers, and to present to them each month reading matter which will keep them in close touch with the work on all the projects of the service, and help them to attain the highest degree of success in the great work of reclaiming our idle lands.

CURRENT COMMENTS

Gathered from the Project Press and People

By C. J. Blanchard, Statistician.

FROM May 21 to August 6 the statistician and the photographer were in the field gathering film material for the bureaus of Parks, Education, Indian Service, Geological Survey, and Reclamation Service, which are to be exhibited at the Brazilian Exposition. The expenses of the trip were contributed from the exposition funds. Twenty-six reels have been edited and assembled with Portuguese titles and are now en route to Rio de Janeiro. All the material used in these reels was collected by the Reclamation Service, and the subjects included scenes on all projects, many Indian reservations, and National Parks. The scenario of the service entitled "Making Homes for Americans," in five reels, graphically illustrates the progress of the engineering work on the several projects. All the prominent and spectacular structures are shown, some with views of construction. Two complete reels were used for this purpose. Three reels illustrate the achievements of the settlers in making the desert bloom. Views of the unreclaimed deserts in New Mexico, Arizona, Colorado, Nevada, Idaho, Washington, and Montana are followed by the successive steps of the settlers in developing these waste areas into prosperous farmsteads. The cabins of the pioneers are contrasted with many of the beautiful and artistic homes of our farmers. The planting, cultivation, and harvesting of the principal and special crops, methods of irrigation, use of modern machinery, and like subjects on all projects are included. Attention was also given to the splendid schools, the pleasure resorts, and social life of the people. A large number of the project towns are illustrated in the reels. From the large quantity of negative footage obtained it is now possible to increase our circulation list and thus insure a wider distribution of these pictures in this country. Some of the material has been arranged to be used by the Federal reserve bank in connection with a special reel which is to be shown under its auspices in this country. Through the Bureau of Education many of our fine project schools will be displayed by lectures. The Geological Survey in its scenario, "The Story of Water," is utilizing many of the best project scenes. Reclamation films are in demand, and the comment received from the centers making use of them is exceedingly gratifying. It is regretted that our prints are limited as a rule to only one set.

Three most enjoyable days were spent at Three Rivers, N. Mex., on the ranch of Secretary Fall. The property embraces many thousands of acres of land leased from the State and a number of cultivated

ranches nestling along the lower slopes of the Sierra Blanca Mountains. The home ranch is located near the station on the Rock Island Railway and is one of the most attractive homes in the State. The old colonial house, reminding one of the Southland, both in architecture and in the gracious hospitality dispensed by its occupants, is almost hidden by beautiful trees. Its spacious, well-kept lawns, orchards, gardens, flowers, and commodious barns and outbuildings evidence many years of planning and a genuine love of the country. The several large ranches under the supervision of experienced managers are developed for special lines of stock raising, which is the principal aim of the whole property. Secretary Fall has two hobbies—good horses and cattle. The handling of range cattle requires several hundred horses, and the native strains are being improved by crossing with some of the finest of Kentucky saddle stock.

One of the ranches is devoted almost wholly to the production of high-grade Herefords, the bulls being bred to range stock. Hogs and sheep, while of lesser importance, are raised for home consumption and for the market. The dairy herd is made up of a lot of registered Holsteins.

The irrigation system, supplied from Three Rivers, is being gradually improved and extended. Some of the canals are cement lined, and plans are being made to develop power for lighting and for pumping. The winter range is extensive and in normal years carries a large number of cattle. Winter feed and alfalfa for stock are grown on the irrigated fields, together with all the vegetables and fruits required for the families of the superintendents and the many laborers employed. The labor is largely Mexican, and each family occupies its own home with sufficient ground for garden and a small amount of stock. Many of these families were born on the place, and to them the Secretary is familiarly known as "the Judge."

The mountain scenery about the ranch is comparable with that of some of our beautiful national parks. The national forest, which comes down to the boundaries of the ranch, contains a variety of views which offer a constant surprise and delight to the visitor and the photographer. Sierra Blanca lifts its bald crest 10,000 feet high, and from its summit a wonderful view is obtained. Through magnificent forests of oak, pine, and aspen a dozen sparkling brooks descend in cascades and waterfalls. Here the coolness and shade are in most inviting contrast to the heat of the desert just below. The winding horseback trails,

each a favorite haunt of the Secretary, lead through deep canyons to elevations commanding views of desert and plains almost limitless in extent.

The desert is not without its charm. To one unfamiliar it seems a desolate waste, but a glance at the sleek cattle and the frisky cow ponies grazing on it showed that its vegetation, scant though it seemed, was not lacking in nutriment. On the eastern boundary we traced a broad terrace rising several feet above the general level and extending to distant mountains. This is the malpais—the wide flow of black lava which in an early period of world making was poured out in great volume from some ancient volcano and submerged hundreds of miles of plain. On the southwest, dazzling in the sunlight, lay the gypsum hills, a region of mystery and dread. On our trip across the desert we dropped into the dry bed of an ancient salt lake, its surface as level and smooth as a concrete pavement—an ideal course for the joy rider, with no fear of watchful traffic cop to check our inclination to “step on her.” Ascending the steep bank we ran suddenly on a herd of asses as wild as any deer in the forest. One glimpse was all we got, as they passed quickly out of sight in a cloud of dust. “Chicken feed,” said the driver. “The Mexicans shoot ‘em in the winter for feed. It takes a long-range rifle and a good shot to get one,” he added. We left Three Rivers ranch with regret, convinced that if it were ours, the emoluments of high public office would never tempt us to leave it. A reel of motion film is being made up and will be shown on the projects this winter.

From Three Rivers to El Paso and the Rio Grande is a short journey. Here we added to our collection of pictures some up-to-date scenes. For the Bureau of Education we photographed the new High School at El Paso, with its magnificent stadium. At Mesilla Park we got the State college and grounds, and at Las Cruces the Palace of Agriculture, which domiciles the irrigation district and the service under one roof. At Tucson we collected much interesting material, including the State college, and just outside, old San Xavier, the historic Franciscan Mission of early Spanish architecture, where the sisters are now teaching the children of the peaceful Papagos. Thence northwestward in the valley of the Gila, the oldest continuously irrigated land in America. Here the hoary ruins of Casa Grande, whose history is lost even in Indian tradition, held us under its spell. On to Florence and eastward, where the engineers of the Indian Service, laboring under brazen skies and the fear of flood, have laid a massive slab of concrete to guide a demon river into channels of service for Indians and whites. Down the valley into the land of the Pimas, always the friend of the settler in Apache days, we rested for a time in the oasis at Sacaton, where the Indian school and farm are in part repaying a nation's debt to redmen friends. Here

another great structure is planned to insure the crops of an industrious people. Under the wide spreading branches of a great palm we encountered two young Indian girls deeply interested in a book outspread before them. Our curiosity was not satisfied until we had glanced at its pages. It was a book of songs set to music, and the maids were studying it for a recital which occurred later in the evening to the accompaniment of an excellent orchestra.

At the dairy next morning we found a number of the Indian boys milking fine Holsteins, working the separator in the creamery, and getting practical knowledge of butter making. On the farm we saw them using modern machinery, cultivating cotton, mowing alfalfa, building barns, grading roads, irrigating, and in a multitude of other tasks which are fitting them for their duties on the lands the Government is preparing for them. It was a gratifying evidence of a wise and thoughtful administration of the trust imposed upon the Government.

Just a day in Phoenix, mostly devoted to the exercises at the splendid Indian school there. The close of the school term was marked by many games of skill and athletics in which boys and girls took part. Two days among the Mohaves on the Colorado and a fine opportunity of seeing the great river in one of its wild moods. As we looked on the turbid waters we visualized Blythe Valley just below, a scene of ruin and wreckage, and Imperial and Yuma, nearer the Gulf, in a frenzied panic and fright, pouring out hundreds of thousands of dollars in frantic efforts to restrain the rising waters from destroying that rich empire behind the levees. An enormous and unnecessary waste of human effort, because a few miles above in its mighty gorge the engineers could check this wasted flood behind a great dam, and this water, now speeding uselessly to the sea, could make a million acres smile a harvest and a hundred thousand families independent. The downward rush of waters now menacing the property of a hundred thousand people could be harnessed and made to move the wheels of a thousand industries in half a dozen States. Why do we wait?

At Yuma we found great changes. The city grows more metropolitan each year and the valley more beautiful. On the mesa the glint of water shows in long lines of canals which furrow its surface. Hundreds of acres are being cleared and planted to citrus trees. New homes are springing up. The faith of the people which has never wavered has opportunity of realization now that water has been brought to the upland desert. We witnessed and photographed the thrilling battle which was going on to restrain a wild river. The scene was terrific—train load after train load of huge rocks dumped into the yellow stream disappeared without a trace. Night and day the fight went on. Once the Colorado set strongly against the Arizona levee and 100 feet of levee track and cars

vanished from view in less time than it takes to tell it. Over in Imperial the same battle was going on at frightful cost of human effort and money—and without assurance of permanent relief.

From Las Vegas, Nev., by auto across 30 miles of uninhabited and scorching desert we sped to where the Colorado flows out of its mighty gorge, the Black Canyon, which is one of the proposed sites of the great Colorado River Dam. By reason of high water, entrance to the canyon to the point investigated for a site could be made only over the cliffs. These were of smooth, black malpais, slick as glass with crevices filled with fine sand blown up from the river bed. The photographer and the secretary of the chamber of commerce, after seven hours of climbing, sliding, and wading, managed to get down to the site and made a few still pictures. It was impossible to transport the heavy moving-picture outfit, and the statistician, after getting stuck in a crevice, whence he was ignominiously yanked by three men with ropes, decided that he would postpone further investigation until the Government furnished an airplane. It is no place for a fat man anyway.

At the railroad station of Lund, Utah, we were met by a cheerful young Mormon, a former aviator in France, who took us in tow for a long trip with a big Buick into Utah's Dixie, where we explored the wonders of our newest playground, Zion National Park, and later the greatest and most wonderful evidence of erosion on earth—Bryce Canyon. As project people are to see our pictures of both, we shall not attempt description here. To add to Utah's scenic views we photographed Ogden's Canyon, the charming resort of the Gate City of the Saints.

In the "Valley of Siphoned Waters" we followed with camera from the great spring which gives birth to Malad River along the rim of the great wall of Snake River Canyon, the concrete lined canal of King Hill project. Truly a wonderful engineering work is this. For 13 miles it hugs a steep slope far above the great river blinking in the sunshine below. It crosses deep ravines and side canyons in enormous siphons of concrete and wood pipe, and twice spans the river itself. It is a splendid example of American engineering daring and skill. Its accomplishment spells permanent prosperity for a beautiful valley in historical location on the Oregon Trail, a valley of incredible soil richness, of fine climate, a veritable garden of fruit and flowers. Thence to Washington and Yakima, the premier project of the Northwest, of which more anon.

NOTED HERE AND THERE.

Salt River project, Arizona.—The first carload of grapes marketed by the Arizona Grape Growers' Association in Boston sold for \$2,435, or \$260 a ton. At this price it is figured that the yield of 1 acre of early grapes brought \$1,970. The association is urg-

ing the drying of grapes as a new industry for the valley, as the soil and climate are very favorable.

Salt River Valley Valencia oranges won the first prize at the orange show in Anaheim, Calif. The acreage in oranges in the valley has increased from 543 acres in 1906 to 2,108 acres in 1922.

The Tempe Normal School is conducting a 50-acre model farm in connection with its agricultural course and is fitting a large class for their future work as agricultural teachers. The business side of farming and modern methods of cultivation are given special attention. Rural economics, agricultural English, sanitation, chemistry of soil, values of foods, etc., are taught.

Yuma project, Arizona-California.—Formal indorsement of the Arizona Pima-cotton Growers' cooperative-marketing plan has been given by the Yuma County Bankers' Association in the following resolution:

"Whereas the plan of orderly marketing, as outlined, in the contract of the Arizona Pima-cotton Growers' cooperative-marketing association appears to be a plan destined to benefit the growers of cotton and a start forward in a movement for better marketing conditions; and

Whereas this contract now being circulated appears to meet the requirements, the plan is hereby approved by the Yuma County Bankers' Association."

Orland project, California.—Orland's Jerseys continue to capture blue ribbons at the stock shows. The latest successes in this line were at the recent State fair, where Orland brought back 3 first, 30 seconds, 2 thirds, and 2 fourth prize. The California Club boys won several first and second prizes and one championship.

With the exception of a few of the latest nuts, the almond harvest in this vicinity is finished. The yield in almost every case has been exceptionally heavy. The Orland County was one of the few almond-growing districts in the State that entirely escaped injury by frost last spring, and the groves have had a splendid season, the trees bearing in most cases as heavy a crop as they could stand. The first carload of the new crop was shipped recently, one of the largest cars obtainable being utilized. The shipment consisted of 768 bags, weighing upward of 28 tons. The total tonnage raised in this vicinity the present year can not be estimated till the shipments are more nearly done with, but the yield is much greater than in any former season, owing to the new orchards that are coming into bearing, and the older growth of others that hitherto have yielded only a small amount owing to their youth. The almond men expect to realize a good price for their this season crop, and the aggregate income will form an important item in the revenue of the community.

Grand Valley project, Colo.—The following sensible editorial from the Sentinel is applicable to every one of our projects:

The benefits of a home market for the farm productions were never more forcefully demonstrated than they are this season. Those farmers who have raised tomatoes and beets are not worrying about the markets, the lack of cars, or the strike situation. They will harvest their crops and deliver them to the factories and receive their money.

Neither is the man who is keeping a dairy here and delivering his cream to the factories in this county having any trouble about the problems that are facing the man who must ship his produce to a foreign market. He is marketing his hay and his other feeds right at home and it is being sent abroad in a condensed form.

The same thing is true of the men who are raising hogs and cattle to a greater or less degree; they are not com-

pelled to ship their products to market within the month, but can hold them until the situation changes.

Therefore anything which develops a home market should be encouraged; we ought to have a plant which will take a large per cent of our peaches just as our cherries are now taken by the Currie factory; a large per cent of our Bartlett pears should also be shipped to market in cans.

Our factory and manufacturing interests are growing fast and this will be shown by the splendid display at the coming fair and stock show.

The Grand Valley crop of apples, peaches, and pears for 1922 is estimated at 2,900 cars as follows: Apples, 1,000; peaches, 1,200; pears and mixed fruit, 700.

Did anybody ever see a field of sweet clover so rank and thick that a team of horses couldn't go through it? Aaron Sheets marched his big team and mower into his sweet clover one day last week expecting to cut it for seed, and the horses became so tangled and lost that Mr. Sheets had to take the scythe and mow a road out. That's how everything grows on the Highline. Just bring on the prices and the farmers are there with the goods.

Boise project, Idaho.—The depression in farm market prices naturally is reflected in the number of car-load shipments from the valley. The splendid yields of crops generally, if accompanied by fair prices, would have shown a heavy outgoing traffic. The low prices of 1922 have caused a big slump in shipments, and from July 21 to August 21 the car-load exports fell below those of any year since 1918—only 239 loads left the valley, as against 416 in the same period of 1921. The present price of potatoes was so low on August 31 that digging almost entirely ceased. All crops are excellent.

Minidoka project, Idaho.—The enormous crop of spuds on the project this season is giving the growers considerable concern owing to the lack of adequate storage. It is estimated that the 8,000 acres planted on the North Side will yield 1,000,000 sacks, or a total of 3,000 cars. This enormous crop must be shipped during September, October, and November, and will require at least 30 cars a day. An effort is being made to obtain storage space in the Paul sugar factory, which would take care of 500,000 sacks. At the prevailing price for spuds farmers declare it will not pay to dig the crop. The quality of the crop is first class, which means there is none better.

One of the project's good farmers, Ernest Jullion, is earnestly recommending his neighbors to plant a small acreage in head lettuce, which he has demonstrated can be produced profitably on the project. Cooperative growing, in his opinion, would be of advantage, as it would make marketing simpler and insure quantity production. He gained his experience in Boise Valley, the home of fine lettuce, and says the Minidoka product is better. More diversified crops on the project are desirable.

Flathead (Indian) project, Mont.—One of the best yields of wheat so far reported in the valley was that on the P. F. Hern place southwest of Polson. One hundred acres on this place averaged 42 bushels to the acre. The wheat was put in last fall on summer-fallowed land that had been well and frequently worked. The results show that good farming is as important as moisture in producing good crops.

Reports have been received of other splendid yields on land that had been kept clean and the moisture conserved by frequent harrowing, subsurface packing, and good farming methods.

North Platte project, Nebraska-Wyoming.—Visual demonstration accompanied by good advice from an expert is provided through a clever scheme of the county agents of Morrill and Scotts Bluff Counties. A tour of the beet farms is arranged with stops at good, bad, and indifferent fields. At each stop the experts using the field before them explain to the farmer the reason for small or large crops, and drive home their arguments for better methods. The facts impressed in this manner take hold on the farmer's mind, and his own fields next season are likely to show much improvement. On the latest tour of the valley the farmers were shown fields lying close together, where the yields ranged from $3\frac{1}{2}$ to 18 tons of beets per acre, the difference being due generally to careless and neglectful methods of some of the farmers.

Newlands project, Nevada.—"Great oaks from little acorns grow" is exemplified by the steady growth of the cantaloupe industry on the project. The Hearts of Gold brand, an exclusive type produced here, has made a distinct hit in the markets of the effete East, and produce dealers from distant New York have journeyed across the country to contract for the Newlands project's crop. Two cars of Fernley "cants" struck the New York market during a dull period, yet notwithstanding were sold at \$3.50 per crate. One of the best crops was grown by C. W. Strock, whose yield ran 250 crates per acre on a 3-acre plot. The range is from 100 to 200 crates.

Carlsbad project, New Mexico.—The first bale of the 1922 cotton crop was brought to Carlsbad on Thursday afternoon, August 31, by Juan Valdez, a farmer in the Otis district. Juan Valdez received a premium of approximately \$67, which represents two-thirds of the fund of \$100 raised by the local chamber of commerce for premiums to the producers of the first and second bales of the 1922 crop.

The delegation of members of the Rotary Club and the business men of Roswell, about 25 in all, visited Carlsbad recently. A smoker was provided for their entertainment by the local chamber of commerce, after which a general discussion relative to all phases of cotton growing was carried on for several hours. The Roswell business men realize the necessity of a paying annual crop in addition to the apple orchards which require several years for the production of the crop even under the most favorable circumstances. At the conclusion of the discussion relative to cotton growing the project manager screened 75 colored lantern slides showing views on all projects which were received recently from the Washington office. The delegation spent Sunday morning in the cotton fields interrogating individual cotton growers as to their problems and difficulties with cotton growing as compared with alfalfa and other annual crops. They were also shown through the oil mill at Loving. The delegation paid tribute to the project generally and to the cotton crop in particular for the present favorable financial conditions existing among the water users and the townspeople generally.

Rio Grande project, New Mexico-Texas.—Ten thousand bales of cotton will be this year's crop in the Rio Grande project, says a cotton expert after looking over the field.

It averages, he adds, not less than three-fourths of a bale to the acre, and some will yield better than a bale per acre. The lint is a long short-staple of fine quality.

Cotton growers of Texas and Arizona who read this will know at once this is a fine crop, raised with the aid of soil and climate strongly favorable.

The cotton produced in this reclamation district this year will be worth upward of \$1,350,000, at a price no higher than 27 cents a pound. It is a nice, comfortable sum of money to add to the other large incomes from upper and lower valley crops.

Success this year means more acreage will be planted next spring. Demand for the kind of cotton raised here has increased. They are making automobile tire fabric of it now, and that use opens up a wide market.

Everyone in this part of the country will be glad to see cotton production double and treble in importance. It is gratifying that we have as fine cotton land as is to be found anywhere.

Umatilla project, Oregon.—The Umatilla County Bee Keepers' Association has an enrollment of 30 members, including about 80 per cent of the honey producers of the project. The association recently consigned a second full car to Spokane, Wash., and expects to handle a business of \$10,000 this season.

Umatilla County will be represented by four entries in the pig-feeding contests at the Pacific International Live-stock Exposition in Portland this fall. The entries will be made by Wayne Swaggart, of Athena, and Tilford Stillings, of Hermiston, each of whom is feeding Poland China pigs, and James and Billy Waugaman, of Hermiston, who are feeding Durocks. All four boys are members of the county pig club. Each boy selects four pigs from the litter and keeps a record of the time spent and the feed used, thus figuring up the expense. The hogs are shipped to the

show and are judged by their appearance and the economy of gain. They are, after the judging, sold at auction. Last year Wayne Swaggart won first prize of \$40 and Billy Waugaman the second prize of \$33. They also sold their pigs for more than the market price.

Yakima project, Washington.—Hop growers who contracted their crops two and three years ago when the quotations were high are now in excellent shape. They are getting from 26 to 35 cents a pound, while new contracts are ranging from 15 to 20 cents.

The production of the country this fall will reach about 190,000 bales, and there is a market in sight for about 100,000. Yakima produces 30,000 bales, and could easily place its entire crop if the picking and handling standards had been maintained for the past year. Some growers are considering picking only a part of their fields, and the valley yield may be reduced in this manner.

The Yakima Dairymen's Association now has a membership of close to 500 dairymen in Yakima County, representing over 4,500 cows.

A receiving station is now in operation at Sunnyside, where the product of the members is weighed and tested. A share of the butter fat received locally will be handled by the Sunnyside Milk Products Co. and the balance will be shipped to Yakima. The association has erected a plant at Yakima which can turn out 3,600 pounds of butter fat daily and 1,000 pounds of milk that can not be marketed profitably as cream or milk.

Trucks are being operated by the association in all districts, which will gather the cream twice each week. A considerable saving has already been made in haulage cost from the farm.

HINTS FROM PRACTICAL FARMERS

In the Interest of Better Farming.

Good Reasons for Building Silos.

1. More feed in the form of silage can be stored in a given space than in the form of fodder or hay.
2. A smaller loss of feed results when a crop is made into silage than when it is cured as fodder or hay.
3. Corn silage is a more efficient feed than corn fodder.
4. An acre of corn can be placed in the silo at less cost than the same area of corn can be husked and shredded.
5. Crops can be put in the silo when weather conditions are such that it would be impossible to make hay, or cure fodder.
6. More stock can be fed from a given area of land when silage is the basis of the ration, than when hay or fodder is the basis of the ration.
7. There is less waste in feeding silage than in feeding fodder or hay. Good silage properly fed is all consumed.
8. Silage is very palatable to all kinds of stock,

9. Silage, like other succulent feeds, has a beneficial effect on the digestive organs.

10. Silage is the cheapest and best form in which succulent feed can be provided for winter use.

11. Silage can be used more economically for supplementing pastures than soiling crops, because its preparation requires less labor.

12. Converting the corn crop into silage clears the land and leaves it ready for the next crop.

Silos and Silage.

S. P. Clark, assistant agronomist at the Arizona Agricultural Experiment Station, in a recent discussion of silos and silage, with particular reference to the pit silo, sums the matter up as follows:

1. Pit silos are a good insurance for farmers and stockmen; they cost little, are durable, are easy to fill, and can be built largely from the materials at hand.

2. Because of their more uniform temperature winter and summer, pit silos preserve the silage better than silos built above ground; in them excessive fer-

mentation of the silage does not take place in summer, and the silage does not freeze in the winter.

3. About one-half as much power is required to operate a silage cutter when filling a pit silo as when filling an ordinary silo.

4. There is no best silo. Any silo properly made is good.

5. Since silage can be packed more firmly and to better advantage in circular than in angular silos, silos should be built circular.

6. The inside walls of silos should be smooth, uniform, and without pockets, to prevent air spaces occurring and to make possible more efficient packing of the silage.

7. Care must be taken to feed only first-class silage, i. e., silage free from mold, to horses and mules, and then it should be fed only in limited quantities. It is dangerous to feed moldy or frozen silage to pregnant ewes.

Ten Reasons Why Dairy Farmers Need to Cooperate.

1. To assemble their products most economically at country points.

2. To establish and maintain plants for handling their products at country points.

3. To become a factor and wield an influence in the marketing of their products.

4. To undertake actual commercial distribution of their products.

5. To obtain commercial efficiency in the marketing of their products.

6. To stabilize the supply in accordance with the market demand.

7. To secure for producers the services of marketing experts.

8. To reduce the cost of supplies required in marketing.

9. To eliminate speculation and waste.

10. To secure direct and orderly distribution.

BUSINESS MEN IN CITIES COOPERATE, WHY NOT FARMERS?

Later Cutting of Alfalfa Found to be Better Practice.

Delaying the cutting of alfalfa until it is nearly in full bloom has been found a better practice than mowing it soon after blooming starts. The yields are larger over a period of years, and the life of the stand is prolonged by delaying harvesting until the plants are nearly in full bloom.

Hay made when the plants are nearly in full bloom possibly is not quite so palatable, but this is offset by the gain in quantity of hay. Fields cut prior to or at the beginning of blooming show a tendency to die out sooner. Cutting a crop late in the fall so

that not enough growth is left for protection in the winter also has much to do with thinning stands. Alfalfa should be given time to reach a height of 6 to 8 inches before cold weather shuts off the sap flow.

In the past the growing of alfalfa in rows in dry regions has been recommended, but experimental evidence shows that, with the exception of a few rare varieties the seed of which sells for a high price, this method is seldom practical. Where the rainfall is not sufficient to grow alfalfa in broadcast stands it can not usually be grown profitably in rows. A slightly larger yield may be produced, but not enough to pay for the added expense. Also the hay harvested on this cultivated ground is apt to be dirty and it is hard to cut and load.

Accumulating experience also has exploded some old notions about the value of cultivation of broadcast stands. It has been found that harrowing a field of alfalfa ordinarily does not increase the yield, neither does it prolong the life of the stand to any noticeable extent. The modified spring-tooth harrow does not injure the plants, but the disk often kills many and reduces the stand. Some sort of cultivation appears advisable in irrigated regions where the water carries a great deal of silt or where the soil has been compacted by the tramping of cattle pastured on the alfalfa. There is usually little to be gained by cultivating broadcast fields when the stand is good. If weeds and grass work in and reduce the stand it is better to plow up the field and put in another crop for a year or two. It is hard to thicken a thin stand by cultivating it and sowing more seed; in fact, it is a waste of time.

Border Irrigation Rapidly Growing in Public Favor.

The border method of irrigation, followed in many parts of the Western States, is well adapted to a variety of soils and crops and is growing rapidly in public favor. The method consists essentially in the division of the field to be irrigated into a series of strips, lands, or beds, as they are variously termed, by low, flat levees extending usually in the direction of the steepest slope. Sufficient water is turned into the upper end of each strip and allowed to move down the slope in a thin sheet, moistening the soil to a given depth as it advances toward the lower end.

It seldom pays to prepare a field for the border method for one crop. The method is well adapted to the irrigation of alfalfa, clover, and other forage crops, as well as all grains, and the forage crops may be rotated with the grains without modifying the method. It is also possible to irrigate potatoes, sugar beets, and other rowed and cultivated crops by making a slight change in the borders, so that the latitude as to rotation is rather wide.

The most favorable soil for borders is a free-working loam several feet deep, underlain by a more or less impervious subsoil. As the sheet of water flows down each strip the pervious top soil is readily moistened and the heavier soil beneath prevents the waste of water by deep percolation. Borders are also very generally used where the subsoil as well as the top layer of soil is porous, not because such formations are the most favorable but because no other method will do as well.

The cost of preparing land for the border method is low as compared with that required for most other methods if the physical conditions are favorable. At the same time it is usually feasible to obtain a fair crop at small cost by the use of temporary borders, and after the crop is harvested the making of permanent borders may be undertaken without undoing much of the previous season's work.

A smooth, regular surface having a slope in one direction of about 2.5 inches to the hundred feet may be regarded as ideal for the border method of irrigation. It is possible to make borders on slopes 1 inch or less to the hundred feet and on steeper slopes up to 2 feet and more per hundred. Borders have been used on slopes as great as 7½ feet to the hundred feet, but extra care must then be taken to prevent soil and crop erosion.

The amount of water that can be turned into the strip depends on the size of each strip, its slope, and other conditions. In narrow, short strips the head used may be reduced to half a cubic foot a second or from 20 to 25 miner's inches, and in wide, long strips 10 cubic feet a second may be none too large. A large volume of water can not be handled successfully on steep slopes, but it is always possible to divide a head between two or more compartments.

PROJECT WOMEN AND THEIR INTERESTS.

By Mrs. Louella Littlepage.

To the Project Women:

FOR almost a year now the messages from you to me and from me to you, through the columns of the RECLAMATION RECORD, have been suspended. The restoration of the RECORD to its old form fills me with gratitude and happiness, for through it I have profited much from the knowledge of your courageous and progressive work, and through it I am richer by a thousand friends.

During the seven years in which the RECORD carried a section devoted to "Project Women and Their Interests," many letters were received which were both comforting and inspiring. They contained bits of personal experience along the lines on which we are all working and in which we are all interested. Sometimes we were disappointed that these letters were not more numerous and wondered why. Was not the invitation cordial enough? Wasn't there time between your many home duties, or was it because you wanted to be strictly truthful in repeating the weekly "I have left undone those things which I should have done"?

Whatever the reason, let us turn over a new leaf and make the November RECORD a real "home coming" number. If the project women individually or by organizations will relate what they accomplished during the past year, and what new work they contemplate for the future, the compilation will be so attractive that everyone will want to cooperate. Under such ideal conditions the Women's Section would become a living, vital force, an energizing influence in creating a new understanding between communities, and between members of communities.

Every woman has something worth while to pass on to her neighbor. What successful experiments have you made, for instance, in making or saving money, in adding to the beauty and worth of your home and community life, in the training and disciplining of your children, or in any one of the numberless other things affecting the home?

Most of us spend entirely too much time longing and dreaming of the big things afar, but it is of the little, everyday, homey duties we would hear and profit from.

Mr. F. H. Newell, consulting engineer, and former director of the Reclamation Service, has just returned from a visit to most of the northern projects.

The thing which most aroused his enthusiasm was a visit to the agricultural experiment stations and to the farms where the young people, the boys and girls, are taking advantage of the advice and assistance offered in the organization of clubs for raising live stock and producing high grade vegetables. The same energy and enthusiasm which without direction had been worse than wasted in organizing gangs to raid the melon patches are being used in competition as to who can make the best exhibit of live stock and the products of the land, or in the skillful use of tools of the farm and of the home.

There is nothing more inspiring than to see the youngsters leading out their carefully groomed and gayly beribboned live stock, and the solicitude they display for the comfort and good appearance of the various animals, eagerly pointing out the superior qualities to anyone who will listen.

Mr. Newell believes that through these clubs there is being built up the real farmer—including both men and women in this term—the people who are the foundation of our civilization, and upon whom rests the duty of providing not merely the food of the Nation but of sustaining it in all of its home-making qualities.

Too good to be lost are the following items from Belle Fourche and Okanogan projects which were sent in last winter after the change in the RECORD. The suggestions they contain are just as pertinent now as then.

It seems that the Okanogan project people erected a beautiful new school building last year. It cost the district so much that no money was available for certain desirable equipment, so the students promptly volunteered to raise the necessary funds by giving an entertainment in the form of a carnival. There was little time for preparation, but the entertainment was a great success as a result of the enthusiastic cooperation and hard work of the students.

The different rooms of the building were especially decorated for the attractions they were to offer. A number of girls from the junior and sophomore classes served tea and wafers. Their room represented a Japanese tea garden. The decorations were of peach blossoms, chrysanthemums, and Japanese lanterns. To further the effect the girls wore Japanese kimono with large sashes. Their hair was dressed in approved Japanese style, with large chrysanthemums on each side of their heads.

One of the halls housed a candy row, which was very popular. It was decorated with yellow and blue crêpe paper streamers and frills, and the girls wore dainty organdy dresses. There were various other things for sale and the boys put on the side shows. Some of them impersonated the Mack Sennett bathing beauties, and one of the boy students looked very "cunning" in a comfy show case as the incubator baby.

In moving to the new school the eighth grade moved with such well planned efficiency that they lost only one hour out of the school day. They started to move at noon, and at 2 o'clock they were at their new desks engaged in their regular duties.

A Belle Fourche Garden.

Mrs. Jennie K. Thurlow, of Vale, S. Dak., furnished an interesting account of how Byron K. Guzzie, a 16 year old boy, of Vale, showed the project people what could be done in that section with a little gray matter and a few garden seeds.

Byron's parents staked him to a garden patch and some seeds, with the understanding that he was to furnish vegetables for the family table, and this is what he did:

He dug a hot bed in March and started his seed for transplanting at a later date. The melons and vege-

tables furnished the family during the year he estimated at \$30, while the strawberries consumed, preserved, etc., amounted to \$50. The surplus vegetables were sold at a net profit as follows: Cabbage from one-eleventh of an acre, \$70; onions, \$2; sweet corn, \$2; strawberries from one-seventeenth of an acre, \$53; watermelons and muskmelons from less than one-third of an acre, \$30; squash, \$4.25; pumpkin, 50 cents; egg plant, 50 cents; cauliflower, \$33; tomatoes, \$32; celery, \$4. He also received premiums from the Butte County Fair amounting to \$6.50.

Eight different exhibits from the garden won eight premiums at the county fair, six being first prizes. Byron also contributed seven different exhibits to the Vale Community Fair.

To sum up, on less than three-fourths of an acre the total value of melons, berries, and vegetables amounted to \$317.75. Byron was a senior last year in the high school, and he was a little proud of his garden inasmuch as it was his first experience. All the work was performed in spare time.

We would like to know what he accomplished this season.

Mrs. Thurlow believes the garden work of the boys and girls will be the salvation of the Northwest, where she states there is a lack of vegetables and fruit in the home gardens at the present time. She advocates that a hotbed and garden patch be an adjunct of every town and rural school, as well as community gardens for town and village boys and girls.

A report has just come in from Richland County, Mont., which has five canning clubs fully organized and doing effective work. They meet once a week, and at each meeting some fruit or vegetables are canned by the cold-pack method. The total number of girls enrolled in the five clubs is 52, and since the beginning of the work approximately 200 jars of fruits and vegetables had been canned at the meetings when reported, in addition to the work which the girls have done at home. Many of the girls come from homes where little or no canning has been done, and are applying their newly acquired knowledge in canning and in teaching their mothers the new method.

All the girls have made canners which they use, and several have invited guests to visit their cellars and inspect their work. Products canned are peas, beans, carrots, beets, corn, greens, and fruits. Each club is regularly organized, has elected officers, and holds business meetings in regular parliamentary order. After the work of the meeting is disposed of a social hour follows and refreshments are served.

Some of these clubs are on the Lower Yellowstone project.

Only a few days ago an 18-year-old boy was hanged at Atlanta. In attempting to escape with a \$2,500

diamond which he had stolen from a tray in a jewelry store, he shot and killed one man and seriously wounded another.

He was an American boy with probably the average father and mother, and he grew up in an enlightened American city where skilled minds and progressive institutions were available to train him. He had had ordinary schooling, yet some one failed to teach him that the property of others is almost sacredly inviolable, and not to be taken without the owner's consent. Some one let him grow to manhood with no regard for the lives and property of others.

Who was to blame for his crime?

We know little about his life, but from lack of information in the papers to the contrary it is probable that he was sufficiently clad; that he had a place to sleep and food to maintain life and health; yet all this and the fact that he had the ordinary schooling was not enough. So one man was killed, another seriously wounded, and the boy died on the gallows.

Of course, this horrible affair was no concern of yours; of course, it never crossed your mind that your boy ever could do such a thing. Why? Are you doing anything to prevent it? Do you teach your boy to respect the rights of others by example? For instance, do you give him a calf or a pig and when it is sold unobtrusively show him a wise use of the proceeds or do you sell the animal and pocket the money?

Do you read the letters of your children without permission? Do you allow your boy to frighten children, to rob birds' nests, to shoot and kill animals and birds for the sport of killing, or do you give him a dog or some other animal for a companion to arouse his interest in helpless things? Do you see that your boy has an opportunity to indulge in manly sports which inculcate the spirit of unselfishness and fair play? Do you see to it that reading matter of the right kind is available? Do you respect his right to his room, or is it invaded rudely and his belongings disregarded?

And when you are satisfied that you are doing your level best for your own boy, do you rest content in the feeling that you are not your brother's keeper and make no move toward getting a square deal for the underprivileged children of your community?

It is a problem to consider seriously.

And while we are on this subject it might not be out of place to ask how many of our readers saw an article in a prominent woman's magazine about a year ago under the caption "Missing."

It stated that 24,000 girls between the ages of 14 and 21 disappeared from their homes in this country in the year previous, some of them leaving their homes in the cities for more exciting neighborhoods, others going to the cities from their homes in rural

districts. In 1918 the number was approximately 20,000, and in 1917 it was something less than 17,000.

Figures compiled from the reports of the various protective agencies and bureaus of missing persons in the larger cities show that, whereas until 10 years ago the majority of runaway girls was impelled by ingrained delinquent tendencies, to-day the larger number seek independence because of misunderstanding or unadjustment in the home. Moreover, and this is the most striking statement, 80 per cent of these girls are not from the homes of the poor, but from homes where poverty is not the excuse.

There comes a time in a young girl's life when she resents authority; when she is sure that no one is so capable as she of determining what is best for her to do. And what is best, when her mind is a maze of inconsistencies, is usually what she wants to do most. Wisdom is far from her door.

Motherhood is the most glorious and the most difficult of crafts, and few indeed are qualified to advise its members, but I have often wondered if a chance remark I once heard is not the key to one of the many doors of the situation. He was only a little lad of three years, but he earnestly asked his mother, who was chiding him, "Mother, why do you always say 'don't,' why don't you sometimes say 'do'?"

It isn't always easy to substitute things they may do for the things you don't want them to do, but a girl's home may be pleasant, no matter how poor, with plenty of innocent recreation, her friends welcomed, and her work made as interesting as possible. It doesn't take a great deal of opposition to stir up discontent and rebellion in the heart of irresponsible youth, it is true; but they yield just as quickly to sympathy and understanding.

September has turned out to be a busy month for the public-spirited people of Delta, Uncompahgre project. Among the unique activities may be mentioned the Kiddies' Library Cookbook, which is being sold for the benefit of the Rural School Children's Library. This book was compiled by Mrs. Grace Cummings, and contains over 200 pages of tested and tried high-altitude recipes by Delta County's most famous cooks. It contains recipes for everything that's made to eat, from soups to desserts, with a lot of miscellaneous ones for good measure.

The books are well printed and bound, and are sold at \$1 each, the money received from the sales to be used to purchase books for the use of the rural schools. There was a dire shortage of books, and the plan is a clever solution of their problem. These books will be kept at the office of the county superintendent and loaned to the children for a stated length of time. Everyone who buys one of these books is helping the kiddies and at the same time getting much more than their money's worth in the book.

There has also been considerable excitement over the flower show held at the Delta National Bank on the 16th. The bank officials offered the following prizes: Finest display of dahlias—First, \$3; second, \$2. Finest display of asters—First, \$3; second, \$2. The Delta Woman's Club offered for the best collection: First, \$3; second, \$2. Finest and most attractive bouquet entered by a child under 16: First, \$2; second, \$1.

At the close of the show the flowers were to be sold and the proceeds turned over to the city park fund. Returns are not in at this writing, but it is hoped they secured a goodly sum.

Can You Beat This?

A keen rivalry has been going on throughout Oregon and Washington in the production of gigantic cucumbers, and to date the banner belongs to a Umatilla girl.

It all started when a Portland paper gave an account of a cucumber weighing 44 ounces raised by a Mrs. Taylor at Hood River. Another paper came along with an account of a cucumber raised at Wasco weighing 43 ounces, and still another from Albany which tipped the scales at 2 pounds and 13 ounces. A cucumber 11 inches long and 9 inches in circumference is some cucumber, but Mrs. Rowe, on the Sunnyside project, Washington, pronounced it merely a cull as she proudly exhibited one 14 inches long and 11½ inches in circumference. She said she had raised larger ones but never thought of bragging about it.

Becoming a little wearied at the boastfulness of her neighboring towns, Miss Edith Thrall, near Hermiston, Umatilla project, walked out in her garden and plucked for the benefit of the local editor an ordinary pickle cucumber weighing an even 58 ounces. It takes soil and climate and intelligent planting and irrigating to bring about such results.—L. L.

MANUFACTURE AND INSTALLATION OF PRECAST LOCK-JOINT CONCRETE PIPE.

Compiled by W. H. Nalder, Engineer, United States Reclamation Service.

THE basic and distinctive features of lock-joint pipe that have so far been adopted and used by the Reclamation Service are in the details, the method of reinforcing and the means of rendering flexible and water-tight the joints between the pipe units. The basic "lock-joint" patent provides fabric mesh reinforcement extending out of both the spigot and bell ends in such a way that when pipe units are placed together the reinforcement from the spigot end will overlap that from the bell end in an internal recess in the shell of the pipe so that when this recess is filled with cement grout a water-tight locked joint is formed and continuity of the reinforcement accomplished. The bell, the spigot, and the joint recess are entirely within the regular shell of the pipe so that the finished pipe line presents continuous and smooth inside and outside cylindrical surfaces. When watertightness is of prime importance and for pipe under considerable hydrostatic pressure, the projecting reinforcing fabric on the spigot end is omitted and there is substituted therefor a thin copper cylinder with a circumferential, expandable head so placed that it will provide a joint that will permit expansion and contraction in the pipe due to changes in temperature or slight settlement in the foundation and at the same time remain water-tight. Pipes having these two different types of joints are generally designated as "culvert" pipe when not provided with the copper expansion strip and as "copper joint" or "pressure" pipe when the copper is provided. The general rule adopted is to use "culvert" pipe for installations where the hydrostatic head on the center is 10 feet or less, and "copper-joint" pipe whenever this head exceeds 10 feet.

The pipe is reinforced for hydrostatic pressure calculated on the basis of a working stress in the steel of 12,000 pounds per square inch for heads up to 100 feet, and varying uniformly from this unit stress at 100-foot head to 8,000 pounds per square inch for a maximum of 200-foot head. For sizes up to 54 inches in diameter the reinforcement consists of a single line placed near the inside surface of the shell. For pipe of 60-inch diameter and larger a double line of reinforcement is used. Three general types of reinforcement have been adopted. For low hydrostatic heads, and for culvert pipe a single layer of triangular mesh reinforcement fabric is used. For higher heads either a mesh reinforcement fabric, supplemented by wire wound spirally around it, or a cage built up of separate longitudinal and circumferential rods, is used.

All-metal forms are used exclusively. The inside and outside cylindrical forms are each of single metal sheets with suitable collapsing devices. The metal sheets are in general of No. 10 gage thickness. The pipe ends are formed by cast-iron base and top rings that form the bell and spigot ends respectively of the pipe units, and hold the cylindrical metal forms in place while the concrete is being poured. The concrete is poured with the forms in an upright position with the spigot end up. Into the inside form at the top is placed a snugly fitting cover platform consisting of a reinforced flat circular plate that serves to hold the inside form in true shape at the top, and provides a platform onto which the concrete is dumped and from which it flows or is worked into the shell of the pipe on all sides. In general three base rings are furnished with each set of forms so that the curing pipe may be permitted to remain undisturbed on

the base ring for a period three times as long as it is necessary for it to cure before the inside and outside cylindrical forms are removed. Normally, each set of forms is re-used each day and each base ring is re-used every third day.

Lock-joint pipe is now being made on three separate projects for different conditions of service, under different climatic conditions and different types of organization and working equipment. The work on each of these projects is described separately in the following paragraphs by the men in charge of the work, except as covered by the general description of the pipe given above, which is applicable to all.

YUMA AUXILIARY PROJECT.

The Yuma Auxiliary Project is located in the extreme southwestern corner of Arizona. The land being irrigated is known as the Yuma Mesa and rises abruptly from the surrounding valleys, the escarpment varying in height from 60 to 90 feet.

In designing a lateral system for the Yuma Auxiliary Project, it was borne in mind that mesa soils are sandy, and as a whole free from alkali; that the water for irrigation would have to be pumped; and that evaporation losses would be high. To reduce seepage and evaporation losses to a minimum it was decided that pipe lines should be used wherever cleansing velocities could be maintained, and in cases where this velocity could not be maintained the canal sections are to be lined with concrete. The Yuma Mesa Project is primarily for citrus fruit development. A unit of 6,300 acres, located in about the central portion of the Mesa Division, was designated for development and a lateral system to deliver water to each 40-acre tract as designed, provided for the use of lock-joint concrete pipe, as follows:

Size of pipe.	Linear feet.	Size of pipe.	Linear feet.
Inside diameter (inches):		Inside diameter (inches):	
15.....	1,330	36.....	7,700
18.....	52,340	39.....	1,320
21.....	2,680	42.....	4,075
24.....	8,100	45.....	2,300
27.....	10,000	Total.....	97,975
30.....	3,900		
33.....	4,230		

All of this pipe will operate under heads of 20 feet or less.

In designing a plant for the manufacture of this pipe it was contemplated to complete the total requirements as listed above in 300 days. The casing room is a shed like structure 30 by 170 feet in plan, equipped with three overhead hand-operated traveling cranes of 1½ ton capacity each. To the south and

immediately adjacent to the casting shed is the rock bin divided into four compartments, with a total storage capacity of about 200 cubic yards. The crushing plant consists of a crusher; a 45-foot standard belt elevator; and a standard screen, size 32 inches by 8 feet, provided with two sections and a dust jacket. The two sections divide the aggregate into three-eighths inch and 1 inch size. The power for operating the crushing plant is a 40-horsepower gas engine. The crushing plant furnished rock also for road building and aggregate for concrete for other features of the project. It would have been better designed had it been equipped with sand rolls as the crusher used would not furnish enough fine material when operating for concrete pipe work alone.

The aggregate is taken from the bins by gravity into a half cubic yard concrete mixer equipped with a batch hopper and automatic water tank. The mixer discharges into a special cone-shaped concrete bucket suspended from the traveling crane in the main casting shed. The mixer discharge was placed high enough so that no lowering or raising of the concrete bucket was required at any time, and this feature added materially to the economical placing of the concrete in the forms.

The pipe cast is the "culvert pipe" type. The plant is equipped at present with the following assortment of standard metal forms:

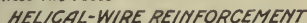
Size of pipe.	Number of sets of forms.	Size of pipe.	Number of sets of forms.
Inside diameter (inches):		Inside diameter (inches):	
15.....	4	30.....	10
18.....	40	33.....	12
21.....	7	36.....	14
24.....	1	39.....	1
27.....	8	45.....	1

The forms were divided in the building into approximately parallel groups; that is, 20 of the 18-inch, 7 of the 36-inch, 6 of the 33-inch, etc., were set in each end of the building and the laborers divided into two squads, one squad in each end of the building, and each squad under a subforeman. Each subforeman had about 12 men working 8-hour shifts. The program was as follows: Cleaning and oiling base rings; removing, cleaning, oiling, and placing inside forms on base rings; placing reinforcing cage; placing sand in sand groove of base ring; removing, cleaning, oiling, and placing outside forms. It was found necessary to wedge the forms at the top to prevent them from getting out of alignment, to keep the outer and inner forms concentric and also to hold the reinforcing cage in place. This work required from three and one-half to four hours' time. The placing of the con-

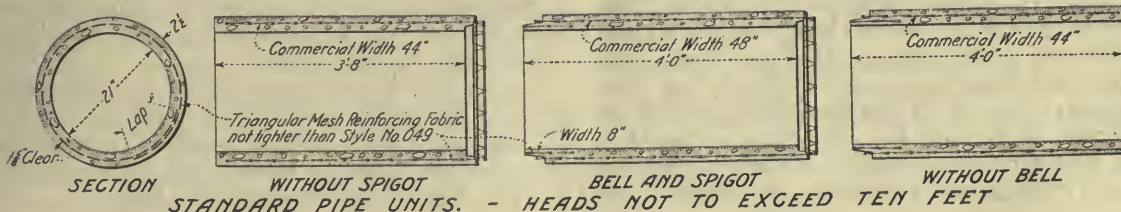
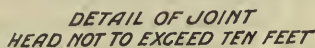
In putting this pipe in place, the work of digging the trench, placing the pipe in the trench, and backfilling is all done with a dragline excavator, caterpillar type. This machine has worked out especially well for this work. Because of the sandy nature of the soil it is doubtful if the usual type of trenching machine would have worked to advantage. This machine has excavated from 300 to 600 feet of trench in eight hours, and has placed from 900 to 1,300 linear feet of pipe in the trench in eight hours.

The following is the approximate organization employed in laying the pipe in the trench with the drag-line excavator: One general foreman, 1 drag-line operator, 1 drag-line oiler, 4 men in trench placing pipe, and 2 men on ground adjusting wire and cleaning pipe before being placed in trench.

Engineer S. A. McWilliams is in charge of the work on the Yuma Auxiliary Project under Project Man-



DETAILS OF STANDARD PRESSURE PIPE HEADS MORE THAN TEN FEET



ager Porter J. Preston. Under him W. H. Porter and W. T. Kiefer are foremen respectively in charge of manufacture and laying of the pipe.

KING HILL PROJECT.

The program for lock-joint concrete pipe manufacture on the King Hill Project for the fiscal year 1922 entailed the construction of the following various-sized pipe in 4-foot lengths:

Linear feet.	Diameter.	Shell thickness.	Head in feet as specified or less.
	<i>Inches.</i>	<i>Inches.</i>	
520	21	2½	100
1,544	21	3	100-160
4,021	24	2½	60
753	27	2½	100
550	27	3	100-180
258	48	4	165
711	54	4½	75

The pipe manufactured is to replace certain machine-banded wood-stave pipe lines and timber flume on timber trestle at gulch crossings. The following assortment of standard metal forms was secured:

Sets of forms.	Diameter.	Shell thickness.
	<i>Inches.</i>	<i>Inches.</i>
2	21	2½
7	21	3
17	24	2½
3	27	2½
2	27	3
1	48	4
3	54	4½

Also one elbow form for each size of pipe.

The construction plant was laid out in the open, and occupied a quadrilateral plat of ground approximately 270 feet square. Instead of using an overhead system for handling the pipe and forms it was decided to use a stationary derrick for handling the larger sizes and a small derrick mounted on a wagon to handle the smaller size pipe and forms. To accomplish this a 2-ton stiff leg derrick, which was operated by a 20-horsepower steam hoist, was erected near the center of the plant and the pipe and forms for sizes of pipe from 27 to 54 inch diameter were mounted upon flat cars and rolled on a 36-inch gauge industrial track to positions in front of a concrete mixer, located near the derrick for filling and thence to a position immediately in front of the derrick for removal of the forms and removal of the pipe from the base rings. The lighter sizes of pipe, namely 24 and 21 inch, had their base rings mounted on stationary platforms in another part of the yard and concrete was wheeled to these small forms in concrete buggies over a system of elevated runways and the forms were stripped from

the pipes and the pipes removed from base rings by means of an 1,800-pound builders' derrick mounted on a dump-wagon truck, which was moved about by one horse.

As the work was done during the winter months, steam curing was used to protect the pipe from freezing and to hasten the curing process. The pipe were all steam cured for about 72 hours each.

This plant was an economical layout on this project, inasmuch as the project was in possession of all the equipment used except forms and certain small items incidental to pipe manufacture.

For identification each pipe unit was assigned a name and number. To insure absolute identification of each pipe, charts were prepared showing each pipe's order in the line for which it was constructed, its manufacturing order, length, shape, elevation, station, diameter, shell thickness, and data on reinforcing of the pipe and bell. Each reinforcing coil, as it was made up, was assigned its name and number, and these noted on a linen tag attached with wire to the coil. The tag was transferred to the form when the pipe was poured and to the copper expansion strip when forms were removed. Each day after yarding, the data on the linen tag were painted on the inside of the pipe and the tag destroyed. Each pipe was checked off in one column of the chart as the reinforcing coil was made up and again in another column as it was painted in the yard. Great care was taken with this item of procedure.

The pipe placed on the King Hill project during the past construction season was distributed as follows:

Pipe line.	Size.	Length.	Distance from King Hill.	Transported by—
	<i>Inches.</i>	<i>Feet.</i>	<i>Miles.</i>	
King Hill siphon.....	27	1,360	1	Wagon.
King Hill siphon.....	21	1,268	1	Do.
Hammett siphon.....	24	4,042	16	Truck.
Ferry Bridge.....	48	91	6	Do.
Camas Road.....	54	194	8	Do.
Slick No. 1.....	54	240	9	Truck and sled.
Slick No. 2.....	54	277	10	Truck and wagon.
Little Alkali.....	48	159	12	Truck.

Four 2-ton trucks were used on this work, and these were loaded with two 4-foot sections of 54-inch or 48-inch pipe or six sections of 24-inch pipe.

Loading was accomplished by rolling the pipe from the skidways in the yard to the bed of the truck. For the 54-inch and 48-inch pipe skidways for unloading were erected at the various structures, and the truck drivers, four in number, were able to unload and roll the pipe into storage.

Placing of 48-inch and 54-inch pipe was materially aided by the use of a drag line operated as a crane. This machine was tried out on the 21-inch and 27-inch pipe also, but it became evident that it did not pay, and its use was discontinued on these sizes.

Except for the experiment with the drag line in laying a short stretch of the 27-inch and 21-inch pipe, the balance of this line was placed in the trench by means of a small jib crane, 6-foot radius, mounted on a sled and dragged along the side of the trench by a team. This little crane was hand operated and worked fast, but could not be used to advantage in other than a shallow trench.

The 24-inch pipe on the Hammett siphon was laid entirely by hand. The method that seemed to give the best results was to take a gang of four men under a foreman, two men in the trench, and two on top. The man on top rolled the pipe into the trench by means of a rolling hitch in a rope, then the men in the trench walked the pipe into place with crowbars and adjusted it for line and grade while the men on top rolled up the next pipe and cut out the opening in the bell required for the joint.

It was found in the case of the large pipe in short siphons that jointing could not be done until the laying of the entire siphon was completed, owing to the tendency of the pipe to move slightly from side to side as laying was in progress. This condition was most evident on the steep slopes. For this reason a separate crew put in the joints on the 48-inch and 54-inch pipe lines. It consisted of four men and a working foreman. One man was used as a night fireman to keep the pipe warm and prevent freezing of the joints. The maximum output of this gang was 12 joints in 54-inch diameter pipe per day. Only 12 forms were available.

The greatest trouble in making the joints was undoubtedly in cleaning out the joint opening preparatory to putting on the forms. The steeper the slope on which the pipe is laid the harder it seems to be to keep the joint openings clean. This difficulty can be largely overcome by cutting a second hole in the bell opposite the hole used for grouting and taking a shovel full of dirt out of the subgrade under this second hole when the pipe section is laid. This leaves a sump into which the accumulation in the joint may be swept out in a very short time compared to that required to clean the joint by the old method.

Difficulty was experienced in securing a solid joint at the top of the pipe, owing to settlement of the grout under the copper after the grout had become too stiff to flow from the pool on top around the copper and into the void caused by the settlement. This may be remedied to a certain extent by using a deeper pool of grout on top, thereby increasing the head.

Jointing the 24-inch and 27-inch pipe was retarded somewhat by the lack of room in which to work when setting the forms on the inside of the pipe. Twenty-five joint-sealing forms were used for the 27-inch pipe.

For the 24-inch pipe 40 standard joint-sealing forms were used on the start, but these were supplemented with 60 forms made on the project. These home-made forms consisted of a strip of 6-inch rubber belting

held in place inside the pipe by two spring-steel hoops wedged tight at the ends. This type of form gives a much smoother joint, is more easily placed and transported in the pipe, and requires less plaster-of-Paris pointing to make it grout tight than the standard all-metal sealing form.

The 21-inch pipe was jointed on the outside, although it was necessary to send a man into the pipe to point up the joint cracks before pouring. Difficulty was experienced in keeping men on this job, although they were paid 33½ per cent more than the men working outside. For all of the small pipe a board mounted on casters was used to aid the men traveling inside, but at best it is a hard job. It was found advisable to leave out a section of pipe when laying at intervals of about 500 feet, so that the men inside would not have too long a trip to get to their work. These sections were placed, after the jointing had reached them, by connecting to the pipe on each side with a concrete collar.

Concrete collars were used in addition to the regular joint on sections that had the bell cracked badly in manufacturing or handling.

Walter Ward was project manager on the King Hill project. Under him A. M. Rawn, engineer (the present project manager), had direct charge of the manufacturing plant, and E. C. Pantan, engineer, had charge of the laying of the pipe, and to them credit is due for the almost perfect record of building and laying the pipe. Only one pipe of the entire program had to be repaired, and only two joints repaired after the siphons were completed and water turned in.

NORTH PLATTE PROJECT.

The North Platte project is located in the extreme western part of Nebraska and partly in Wyoming.

The program of lock-joint pipe construction on the North Platte project was not so well defined as that on the other two projects described, but it was in general intended to use this pipe for various structures on the Northport and Fort Laramie divisions now being constructed and on the constructed Interstate division for replacement work. With this in mind, an assortment of standard forms and other equipment was purchased for the manufacture of the pipe in sizes varying from 24 inches to 60 inches in diameter.

About 1,040 linear feet of pipe in all sizes have so far been manufactured on this project, and this was manufactured at two separate plants, the plants being simple and involving little special equipment except forms.

The operations of manufacture were as follows: The materials were shoveled by hand into the loading hopper of the mixer, and from the mixer the material was wheeled up an incline to the top of the forms and dumped directly from the wheelbarrows into the forms. The horses which constituted the supports of

the incline and dumping platforms were made as light as possible, so that two men could easily move them from place to place. The pipe was lifted from the base rings by means of a tripod and windlass.

An average crew of four men was employed on making the pipe and the results were usually as follows: On one day, four 24-inch pipe and three 42-inch pipe; the day following, four 27-inch pipe and two 42-inch pipe. This included all operations from screening the gravel, placing reinforcing, and erecting the forms to pouring concrete.

As all of this pipe was manufactured for low heads, it was reinforced with triangular mesh reinforcing fabric, and no particular means of identification was necessary. All of the pipe was made during cool weather and protection from freezing weather was necessary rather than from the too rapid setting.

Very good results have been obtained with all pipe manufactured so far as can be observed by the eye. A little difficulty has been encountered in keeping the reinforcing fabric in proper condition, but this would be true in any style of reinforcing. It is observed after the removal of the forms that the concrete in about the lower three-fourths of the length of the pipe has a very smooth and glassy appearance while the upper portion is a trifle rough and not so smooth.

After the pipe were manufactured and cured they were rolled up an incline onto a wagon having a wide bed, similar to wagon beds used for hauling beets, and hauled to the place to be used. After the pipe were rolled into the trench a tripod was usually used for placing it into exact position. Occasionally in transportation the projecting reinforcing became crushed together and a portion of the bell or spigot was broken off, but such damage as occurred was not serious and in general the pipe would resist rougher handling without injury than would vitrified pipe.

It is believed that the use of the lock-joint pipe will prove economical on all kinds of work, but it appears that it has an especial advantage over the monolithic structure in wet ground. Its use so far on this project has been confined to those jobs where it was absolutely necessary to complete the work before a certain time. It is obvious that much time can be saved on the construction of a siphon, particularly in wet ground where the operations of excavation and pipe laying can be carried on at the same time instead of having to wait until the excavation is completed before concrete can be poured. This applied particularly to siphons of short length.

Andrew Weiss is project manager in charge of the North Platte project.

RECLAMATION LAW NOTES.

By the Chief Counsel.

Farmers' Irrigation District Case in Nebraska.

IN 1915, the Farmers' irrigation district, which embraces lands adjacent to those of the North Platte Federal irrigation project in Nebraska, had a bonded indebtedness of \$2,203,000, bearing interest at 6 per cent per annum. The district's predecessor, the Tri-State Land Co., was owing the United States a balance of \$475,000 under a contract providing for irrigation water from the Pathfinder Reservoir for use on lands of the district. The United States was desirous of having the district assume the contract for the payment of the \$475,000, of acquiring a permanent carriage right for 250 second-feet of water through the district's main canal, and of securing a right for the cooperative use of the district's drainage works for lands within the North Platte project.

The Farmers' irrigation district was in serious financial straits, was unable to meet the payments upon its bonded indebtedness, and there was danger the project would become an absolute failure. By written proposal dated June 22, 1915, the holders of the district bonds agreed that if the United States would take over and operate the district irrigation works \$203,000 of the district bonds would be canceled, the interest rate on the remainder would be

reduced to 4 per cent per annum, and the principal would be made payable over a period of 20 years under the plan of payment provided by the national irrigation law.

By contract dated August 10, 1915, between the United States and the district, the latter assumed payment of the \$475,000 for stored water from Pathfinder Reservoir and the United States acquired a permanent carriage right for 250 second-feet of water through the district's main canal. Provision also was made for cooperative use by the United States and the district of the latter's drainage works.

By contract dated December 12, 1917, between the United States and the district it was agreed that the United States should take over the irrigation works of the district and operate the same until full payment had been made to the United States for said stored water and to the bondholders on said bonds to the extent of \$2,000,000, such taking over to become effective upon submission to the Secretary of the Interior of satisfactory evidence that the conditions set forth in the proposal of June 22, 1915, had been met by the bondholders.

Subsequently a dispute arose between the bondholders and the irrigation district as to whether the contract of December 12, 1917, between the United States

and the district was a compliance with the terms of the proposal of June 22, 1915. The district failing to make payment of certain sums due on the bonds, on November 14, 1918, the bondholders brought suit to recover the amount due, in which suit question was raised as to the validity of the contract of December 12, 1917. The trial court found that the proposal of June 22, 1915, and the performance by the irrigation district of the stipulated requirements upon which the proposal was based as above stated constituted a valid contract and should be enforced according to its terms. Upon appeal the decision of the lower court was affirmed by the circuit court of appeals. (New York Trust Co. v. Farmers' Irr. Dist., 280 Fed. 785.) The following points were decided by the appellate court:

Laws, Nebraska, 1917, chapter 191, passed to enable irrigation districts, organized under the laws of Nebraska, to cooperate with the United States in the matter of irrigation projects, as contemplated by act February 21, 1911 (36 Stat. 925), was an independent act complete in itself and not affected by constitution of Nebraska, article 3, section 11, providing that no law shall be amended unless the new act contains the section or sections so amended.

Under Revised Statutes, Nebraska, 1913, section 3467, as amended by laws, 1917, chapter 83, and under laws, Nebraska, 1917, chapter 191, an irrigation district of Nebraska was given authority to make a contract for the operation of its project by the United States.

A contract by a Nebraska irrigation district giving the United States authority to operate the district's system and obliging the district to collect taxes sufficient to meet the expenses of operation and to exercise the control of the service given by Revised Statutes, Nebraska, 1913, section 3465, as amended by laws, Nebraska, 1917, chapter 82, for the purpose of enforcing irrigation taxes, did not deprive the district of its power to determine the amount of taxes to be levied, and did not invade the sovereign powers of the State.

The management and operation of an irrigation system for the benefit of the landowners is not an exercise of any of the powers of State sovereignty, so that a contract giving such management to the United States was not a grant of State sovereignty.

Where a State irrigation district had purchased from the United States Reclamation Service a water right which was not yet paid for, and had contracted to carry through its canals water for the reclamation project, and there was grave danger the irrigation district would be unable to operate its system, the Reclamation Service had such an interest in the district that it might contract for the operation of the district under act February 21, 1911 (36 Stat. 925), authorizing the Secretary of the Interior to cooperate with irrigation districts for the construction or use of reservoirs, canals, or ditches.

The Reclamation Service has authority to take over the operation of a State irrigation district system for the purpose of protecting its claims against the district without acquiring absolute title to the project.

In a proposal by the bondholders of an irrigation district agreeing to reduce the principal and interest of their bonds if the United States should take over the district, the words "take over" must be given their primary meaning—to assume control or man-

agement of—and do not require the transfer of absolute title to the United States, especially where the other provisions of the proposal were not consistent with the assumption of management and control by the United States.

A contract between the bondholders of an irrigation district which was unable to continue the operation of its system, the failure of which would have resulted in loss to the bondholders, whereby the bondholders agreed to surrender less than 10 per cent of their bonds and to give additional time at lower rate of interest for payment of the remaining bonds, in consideration of the taking over and operation of the district by the United States, was not burdensome.

Where the bondholders of an irrigation district agreed to release a portion of the bonds and to accept a lower rate of interest on the last of the bonds, on condition that the United States should take over the operation of the system and should procure from the Secretary of the Interior the approval of the United States for the terms of payments of the remaining bonds of the district, the district was properly charged with interest on all its bonds prior to the time it procured the approval of the Secretary of the Interior, though before that date it had performed the condition of securing a contract for the operation and maintenance of its system by the United States.

What is a Public Purpose?

The extent to which the United States may lawfully use public moneys for the reclamation of waste lands is a frequent subject of discussion. The right to use such moneys depends principally upon whether the use is for a public purpose. An interesting case upon this point was recently decided by the Supreme Court of the State of Minnesota, in *Central Lumber Co. v. City of Waseca et al.*, 188 N. W. 275. The defendant city by its charter authorized the establishment and maintenance of a public coal and wood yard from which the inhabitants of the city could purchase these necessities at retail. There was also a provision in the charter that taxes should be levied for the purpose of financing the project. The suit was brought by the lumber company to enjoin the city from maintaining the yard and collecting taxes for its upkeep. The principal question involved was as to whether the establishment of a municipal coal and wood yard was a "public purpose" within the State constitution, for which taxes could be lawfully levied. The supreme court upheld the action of the lower court denying a temporary injunction. Judge Dibell said in the course of the opinion:

The question is whether the establishment of a municipal coal and wood yard is a public purpose. The constitutional validity of the charter is presumed. It is to be assumed that in framing their charter the people were informed of conditions, such as the sources of supply, the ability and disposition of dealers to care for local demands, and other relevant factors affecting the situation, and found that public necessities and conveniences were such that the establishment of a municipal fuel yard was a public purpose. They have the responsibility of their finding and the wisdom or folly of the policy which they au-

thorize. Their determination of public purpose is not final. It is accorded weight; but, finally, the court must determine as a judicial question whether the purpose for which taxes are exacted is public.

Economic and industrial conditions are not stable. Times change. Many municipal activities, the propriety of which is not now questioned, were at one time thought, and rightly enough so, of a private character. The constitutional provision that taxes can be levied only for public purposes remains, but conditions which go to make a purpose public change.

In our judgment the establishment of a municipal fuel yard is a public purpose.

"Final Settlement" Under Government Contracts.

The time within which a subcontractor can bring suit on a Government contractor's bond under the act of August 13, 1894 (28 Stat. 278), as amended by the act of February 24, 1905 (33 Stat. 811), begins to run at the date of the "final settlement" by the Government, which means the date when the contract has been performed, and the Government, in its final adjustment, according to administrative methods, has determined what, if any, amount is due thereunder. Correspondence between the Government and the contractor, after the Government has ascertained the amount due, which relates to two small items of the account and has no material bearing on the settlement, does not postpone the date of final settlement from which the subcontractor's time to sue on the bond began to run, especially where the Government issued the subcontractor a copy of the contract and bond, to which he would not have been entitled unless six months had expired from the final settlement. The failure of the general contractor to approve the Government's determination of the amount due under the contract does not postpone the date of final settlement, from which the six months which must elapse before the subcontractor can sue on the bond begins to run. The law permitting subcontractors to bring suit on the bond given by the contractor is highly remedial, and should be interpreted liberally in favor of the subcontractors. (*Arnold et al. v. United States*, for use of *W. B. Guimarin & Co.* (S. C.), 280 Fed. 338.)

Arizona Irrigation District Law Constitutional.

The Supreme Court of the State of Arizona, in the matter of Auxiliary Eastern Canal irrigation district (207 P. 614), holds that the irrigation district law of Arizona (Laws, 2d Sp. Sess., 1915, c. 8, and Laws 1921, c. 149), is not unconstitutional, either as authorizing a levy of taxes which is not uniform, or as providing a system of taxation excluding from its operation all personal property, or as permitting an unlimited levy of taxes on real estate.

Irrigation Easements.

Where one claiming an easement uses it as often as it is necessary for him to do so, the use is generally held to be continuous, and this is particularly true with reference to easements connected with

irrigation. (*Irrigated Valleys Land Co. of California v. Altman et al.*, 207, p. 401.)

Bills Relating to Federal Reclamation.

H. J. Res. 270.—Amendment providing for an appropriation of \$20,000,000 for Federal irrigation, introduced September 11, 1922, by Senator William E. Borah, of Idaho.

S. 3709.—"A bill to provide for an examination and report on the condition and feasibility of a reclamation project at Hope, Eddy County, New Mexico." Passed the Senate September 9, 1922.

S. 3790.—"A bill authorizing the Secretary of the Interior to enter into an agreement with Toole County irrigation district, of Shelby, Montana, and the Cut Bank irrigation district, of Cut Bank, Montana, for the disposal of the waters of Two Medicine, Cut Bank, and Badger Creeks, not needed for domestic or irrigation purposes by the Indians of the Blackfeet Indian Reservation," introduced July 6, 1922, by Senator Thomas J. Walsh, of Montana. Passed the Senate September 5, 1922.

S. 3887.—"A bill to amend the act of April 16, 1906, relating to the disposition of the proceeds of sales of town lots on reclamation projects," introduced August 4, 1922, by Senator Henry L. Myers, of Montana.

S. 3892.—"A bill authorizing the State of California to bring suit against the United States to determine title to certain lands in Siskiyou County, California," introduced August 7, 1922, by Senator Samuel M. Shorthridge, of California.

S. 3924.—"A bill to authorize the Secretary of the Interior to extend the time for payment of construction charges on the Strawberry Valley reclamation project," introduced August 18, 1922, by Senator Pat Harrison, of Mississippi (for Senator William H. King, of Utah).

District Counsel Cox Resigns.

District Counsel Henry A. Cox, of the San Francisco office, has resigned, effective at the close of September 10, 1922, to accept a legal position with the Federal Trade Commission.

Mr. Cox entered the Reclamation Service November 29, 1918, by transfer from the Department of Labor. He was employed in the legal division of the Washington office until April, 1919, when he took charge of the office of district counsel at Mitchell, Nebr. In October, 1920, he was transferred from Mitchell to San Francisco.

While with this service Mr. Cox made good to an unusual degree. He is a young man of strict integrity, a most conscientious worker, and an excellent lawyer. In his meetings with others he exercises a fine tact, and his discretion and judgment are of large caliber. The Reclamation Service sustains a distinct loss in his going.

—Ottamar Hamele.

Recent Reclamation Orders.

CIRCULAR LETTERS.

- 1149. Coal distribution.
- 1150. Damages due to burrowing animals.
- 1151. Ex-service men.
- 1152. Photographic price list.
- 1153. Economies, Minidoka project.
- 1154. Manual amendment. Correction of form numbers for travel-order blanks.

ADMINISTRATIVE AND STATISTICAL PROGRESS REPORTS FOR AUGUST, 1922.

Monthly conditions of principal Reclamation Service reservoirs for August, 1922.

[Elevation above sea level.]

State and project.	Reservoir.	Available capacity in acre-feet.	Elevation.		Storage in acre-feet.			Out-flow in acre-feet.	Elevation of water surface.		
			Spill-way crest. ¹	Lowest gate sill. ²	Begin-ning of month.	End of month.	Maxi-mum.		Begin-ning of month.	End of month.	Maxi-mum.
Arizona, Salt River.....	Roosevelt ³	1,305,000	2128.1	1924.6	767,149	675,168	767,149	.....	2086.58	2079.06	2086.58
California, Orland.....	East Park.....	51,000	1199.68	1111.68	30,940	14,890	30,940	13,900	1187.08	1173.4	1187.08
Idaho:											
Boise.....	Arrowrock.....	280,000	3211	2956	178,160	51,030	178,160	187,360	3172.8	3097.3	3172.8
	Deer Flat.....	177,000	2518	2488	53,948	23,098	53,948	49,620	2502	2495.6	2502
Minidoka.....	Lake Wolcott.....	95,180	4245	4236	102,170	108,020	110,880	329,557	.....	.....	.....
	Jackson Lake.....	847,000	6709	6728	493,160	245,520	493,160	324,176	6754.42	6743.13	6754.42
Montana:											
Milk River.....	Nelson.....	38,500	2216	2200	27,000	25,800	27,000	500	2212.4	2212	2212.4
St. Mary storage.....	Sherburne.....	66,000	4788	4720	24,080	9,690	24,080	14,390	4756.8	4741	4756.8
Sun River.....	Deer Creek.....	16,700	4130	4085	12,686	11,922	12,686	1,125	4125.8	4125	4125.8
Nebraska-Wyoming, North Platte.....	Pathfinder.....	1,070,000	5852	5670	693,390	464,870	693,390	244,615	5832.07	5814.79	5832.07
	Lake Alice.....	11,400	4182	4159	3,116	528	3,116	.....	4168.5	4161.2	4168.5
	Lake Minatare.....	60,760	4125	4074	26,906	10,989	26,906	.....	4106.6	4093.2	4106.6
Nevada, Newlands.....	Lake Tahoe.....	120,000	6230	6224	.....	.....	.....	28,022	6227.07	6226.5	6227.07
	Lahontan.....	273,600	4162	4066	246,020	201,350	246,020	52,500	4159.1	4153.7	4159.1
New Mexico:											
Carlsbad.....	McMillan.....	45,000	3267.7	3241.6	13,000	.....	13,000	14,000	3260.6	3253.6	3260.6
Rio Grande.....	Elephant Butte.....	2,638,000	4407	4231.5	1,876,910	1,722,358	1,876,910	134,287	4389.5	4380.9	4389.5
Oregon, Umatilla.....	Cold Springs.....	50,000	621.5	560	27,100	11,475	27,100	14,119	604.02	586.94	604.02
Oregon-California, Klamath.....	Clear Lake.....	462,000	4540	4514	398,000	384,000	398,000	.....	4537.62	4537	4537.62
South Dakota, Belle Fourche.....	Belle Fourche.....	203,000	2975	2920	121,550	87,500	121,550	35,815	2963.3	2957.4	2963.3
Utah, Strawberry Valley.....	Strawberry.....	250,000	7558	7517	234,200	222,600	250,000	11,600	7555.8	7554.2	7558
Washington:											
Okanogan.....	Conconully.....	14,400	2290	2232	4,675	2,060	4,675	4,207	2265	2255	2265
Yakima.....	Bumping Lake.....	34,000	3426	3389	33,643	15,555	33,643	18,088	3425.9	3409.9	3425.9
	Lake Cle Elum.....	20,800	2134	2122	10,722	7,720	10,722	3,002	2127.8	2126.4	2127.8
	Lake Kachess.....	210,000	2258	2192	157,578	104,408	157,578	53,170	2243	2228.8	2243
	Lake Keechelus.....	152,000	2515	2425	102,284	18,241	102,284	84,043	2493	2439.3	2493
Wyoming, Shoshone.....	Shoshone.....	456,600	5360	5132.3	449,951	428,481	449,951	78,872	5359	5355.7	5359

¹ Or maximum storage.² Or zero storage.³ Zero water depth at elevation 1902.2.⁴ Amount of silt shown by silt survey deducted from original capacity.⁵ Proposed regulation.⁶ Estimated low-water limit under proposed plan of regulation.⁷ Draft for power purposes.⁸ Elevation of reservoir raised 12 inches by stop logs in spillway.

SALT RIVER PROJECT, ARIZONA.

Water was run in all the canals during August. The demand for irrigation water service was unusually heavy for this season of the year.

Five regular crews were in the field during the month and the following work was accomplished: 57 miles main canal cleaned; 20 miles main canal demossed; 284 miles laterals cleaned; 21 miles canal roads graded; 249 old structures repaired; 3,778 linear feet stake and brush banks built; 1,457 cubic yards embankment placed; 619 cubic yards excavation made; 12 cubic yards concrete placed.

The Ruth dredger removed 5,460 cubic yards from the Grand Canal.

The P. & H. $\frac{1}{2}$ -yard drag line excavated 5,191 linear feet of Chandler pump ditch, excavating approximately 2,400 cubic yards.

The following construction work was accomplished: $\frac{1}{4}$ mile new irrigation ditch built; $9\frac{1}{4}$ miles new waste ditch built; 83 new structures installed; 50 linear feet corrugated pipe installed; 1,368 linear feet concrete pipe installed; 111 cubic yards concrete placed; 19,733 cubic yards earth excavated.

On August 1 a plant for the manufacture of 24-inch concrete pipe was built at the south side camp, and operated during the month.

Work continued on widening of Eastern Canal and the Monighan 2-yard and Lidgerwood $1\frac{1}{2}$ -yard machines excavated 11,973 cubic yards.

Operation of power system.—Total generated during month, 9,715,750 kilowatt hours; maximum output for one day, 342,680 kilowatt hours; maximum load (August 1), 15,030 kilowatts; maximum daily average load (August 2), 14,310 kilowatts; average daily load for month, 13,050 kilowatts; highest daily load factor, 98.2 per cent; lowest daily load factor, 86.5 per cent; monthly load factor, 86.8 per cent.—C. C. Cragin.

YUMA PROJECT, ARIZONA-CALIFORNIA.

Weather conditions were favorable with the exception of a sudden shower on August 23, which caused slight damage to the alfalfa seed that was down. Seed threshing was approximately 50 per cent completed. The price was 13 to 14 cents per pound with little seed moving. Two bales of short-staple cotton were picked and reported sold for 22 cents per pound. Future cotton prospects were good.

A small force was employed changing the metal on the Yarwood flume on the east drain.

The demand for water was larger than for the same month last year, amounting to 16,800 acre-feet as against 13,453 acre-feet for August, 1921. The Ruth dredger cleaned 5.4 miles of laterals, working

28.5 shifts. The 30B Bucyrus continued cleaning the main drain, completing 2 miles.—*R. M. Priest.*

ORLAND PROJECT, CALIFORNIA.

Pleasant weather prevailed during August.

A considerable portion of the fourth crop of alfalfa was harvested and a portion of the almonds was gathered. One carload of almonds was shipped on the 30th, to be followed by several more in September. It is reported that this year's production will exceed that for last year, which consisted of five cars.

A force of four men and one team was engaged in mowing and burning weeds, and in repairing canal banks. Regular water deliveries were continued but the demand was much less than for the preceding month.

Diamond drilling at Millsite was completed on the 15th and both equipment and personnel transferred to the Baker project.—*R. C. E. Weber.*

GRAND VALLEY PROJECT, COLORADO.

During August 2 inches of rain fell and on some parts of the project a small amount of damage was done to crops by cloudbursts. Crop prospects continued favorable but prices for potatoes were so low that few were dug. At the end of the month buyers were offering 55 cents per hundred. The harvesting of peaches and pears was in progress, but because of the transportation conditions all produce was being shipped on consignment with great uncertainty as to prices.

The canal and lateral systems were operated continuously, delivering 12,000 acre-feet to the project lands and the two irrigation districts.

Drainage excavation was continued with two drag lines completing 4,720 linear feet, involving 23,755 cubic yards of excavation.

Preparation of plans for the beginning of construction of the river siphon for Orchard Mesa was continued and it was proposed to start operations in the near future.—*John C. Page.*

UNCOMPAGRE PROJECT, COLORADO.

The dry weather which had prevailed during the summer since April 26 was broken during August, 11 showers occurring at the Montrose station.

The uncollected water rentals due from the season 1921 on August 31 amounted to approximately \$4,433. The total cash collections to August 31 on account of water rentals for the season 1922 amounted to approximately \$50,000.

The demand for irrigation water was particularly heavy up until August 15, and on account of the low stage of the Uncompahgre and Gunnison Rivers during that period it was necessary to rotate to a certain extent between ditch systems. After August 16 no rotation was necessary, all deliveries being made on demand. The flow through the Gunnison Tunnel gradually decreased from 925 second-feet on August 2 to 770 second-feet on August 31. This decrease was entirely due to the low stage of the Gunnison River. On August 28 the Gunnison Tunnel was shut off in order to repair a leak which developed through a tap turn out at milepost 5.72. Upon examination it was found that the leakage waters had washed a hole under the right wall of the concrete approach section, and in order to prevent a serious break at this point a cut-off wall was concreted in front of all of the right wall section and part of the floor

section, and the washed out hole under the wall was back filled with large rock. This work was accomplished on August 29 and the Gunnison Tunnel was opened up on August 30.

The project was visited by several cloudbursts during the month, but no damage was done except for the washing out of part of an extension drop below the Montrose and Delta flume crossing over the Big Sandy wash on California Mesa and for the washing out of about one-fourth mile of the tunnel road to river portal.

The P. & H. drag line completed the excavation of a drainage channel from Dolores Creek to Happy Canon Creek which work was accomplished for the county of Montrose.—*L. J. Foster.*

BOISE PROJECT, IDAHO.

August weather was abnormally hot. Hard showers of short duration occurred at intervals.

Construction work, building operations, and lumbering afforded employment to the greater part of those seeking work. Owing to the low price being offered for farm products the demand for harvest help was very light.

The harvesting of the second cutting of alfalfa was completed. Threshing was well under way. The yield of wheat was reduced to some extent by the extreme warm weather which occurred during the stage the grain was filling. The potato market steadily declined until the market price did not return the cost of digging and shipping. From present indications a large part of this year's early crop will not be harvested. The fruit crop is about normal. The dropping of prunes was very heavy in some localities, but growers estimated a good crop. Few buyers for fruit were in the field who were contracting for small shipments of prunes.

The demand for irrigation water continued heavy during the first half of the month, but gradually dropped off during the latter part as some of the crops were matured. No serious trouble was encountered on the canals. Moss still continued to give some trouble. The tile line on the Laht drain, which collapsed the latter part of July, was opened up. The *Ruth* excavator was in operation the entire month on cleaning canals below Deer Flat Reservoir.

Field studies were continued on the water-logged areas in the west end of the project. A portion of the electrical equipment that had formerly been in use on drainage work was transferred to Black Canyon Dam.

On August 11 the director, chief engineer, and project manager made an examination of the lands along Malheur River in the vicinity of Vale, Oreg., in connection with proposed cooperative surveys to be made with funds provided by the service and the Warm Springs irrigation district.—*J. B. Bond.*

KING HILL PROJECT, IDAHO.

August was hot and dry throughout and, although favorable for construction work, necessitated more than an average amount of water for irrigation.

Government forces completed the installation of the silting plant at the head of the main canal; 5,670 yards of class 1 material was moved from the main canal section by the P. & H. drag line between stations 1072 and 1159. A small force was engaged in the construction of surface drains above the Head End flume. Screening and washing gravel for making lock-joint pipe was begun and at the end of the month 830 yards of material had been washed. The

construction of portable camps and repairs to equipment preparatory to the construction season were well under way.

The United States Bridge Co. had completed 95 per cent of the work under their contract for the reconstruction of the Slick Bridge.

Continuous water service was maintained with the exception of six hours when a small break necessitated shutting water out of the main canal. A small force was engaged in maintenance work and the removal of moss.

Two field parties were engaged on detail structure surveys, cross sectioning main canal and laterals, and on topographic survey of Bennett Creek Reservoir site.

The third cutting of alfalfa was being harvested at the end of the month. Potato shipments at the rate of an average of six cars per day were made up to the 19th, when a fall in the market made it necessary to discontinue shipments. The apple crop looked promising.

A. M. Rawn was designated project manager to succeed Walter Ward, who was assigned to Black Canyon Dam. E. C. Panton, engineer, and L. D. Eakin, senior clerk, were transferred to Black Canyon, Engineer R. K. McComb was transferred from Blackfeet project to King Hill as construction engineer, and R. A. See, assistant engineer, was transferred from the North Platte project as office engineer.—A. M. Rawn.

Prevailing crop prices at close of August, 1922.

Project.	Alfalfa hay, per ton.		Barley, per bushel.	Oats, per bushel.	Wheat, per bushel.	Potatoes, per bushel.
	In stack.	Baled at shipping point.				
Salt River.....	\$10-\$12	\$6-\$8	\$0.75	\$0.53	\$1.20	\$0.90
Yuma.....	9.00	14.00				
Orland.....	9.00	13.00	.62		.96	
Grand Valley.....	8.00	12.00			.90	.35
Uncompahgre.....	7-12		.67	.45	.75	.50
Boise.....	7.00	10.00	.60	.60	.78	.20
King Hill.....	8.00					.30
Minidoka.....	5.00	8-9	.37	.25	.75	.30
Huntley.....	5.00				.79	.80
Milk River.....	9.00		.32	.32	.81	1.20
Son River.....	10.00	16.00	.50	.60	.78	.80
Lower Yellow- stone.....	8-10		.29	.16	.96	.50
North Platte.....						
Newlands.....	7.50	12.50	.60		.93	.75
Carlsbad.....		15.00				
Pio Grande.....		18.00		.65	1.11	
North Dakota pumping.....	12-14		.43		1.04	.60
Umatilla.....	10.00	14.00				.75
Klamath.....	8-10		.60	.40	.85	
Belle Fourche.....	5.00	8.50	.36	.24	.85	.60
Strawberry Valley Okanogan.....	7.00	9.00	.87	.58	.75	.60
Yakima.....		13.50				1.80
Shoshone.....					.65	.60
Indian projects: Blackfeet.....	10.00		.48	.32	.80	1.80
Flathead.....		15.00			.71	.60
Fort Peck.....	10.00			.14	.86	.50

MINIDOKA PROJECT, IDAHO.

August was characterized by an unusual amount of rainfall. On the 19th a severe hail, rain, and wind storm occurred that did much damage in the Starrs

Ferry neighborhood and in Burley. A strip of land about a mile wide on the north side of Snake River also suffered considerable loss.

Warm weather prevailed throughout most of the month. The outlook for crops was one of the best in the history of the project. The second cutting of hay was completed, and wheat had been harvested and threshing begun. Yields of 50 to 60 bushels per acre were reported and of excellent quality. Beets and potatoes were in excellent condition and will give abundant yields.

Demands for water fell off toward the end of the month, dropping to 510 second-feet, pumped at the first lift on the 25th and 26th, and rising to 660 second-feet on the 31st. The total amount pumped was 40,164 acre-feet.

The power house and pumping stations were operated practically continuously.

Owing to a decreased demand for water in the Snake River Valley, the gates of Jackson Lake Dam were closed down sufficiently so that no stored water was released after the 26th. This provided a hold over of 245,000 acre-feet in the reservoir, or 90,000 acre-feet more than in 1921.

On the 28th the county commissioners of Twin Falls County met to consider further the petition for the formation of a reservoir district and to set a date for an election. No final decision had been reached.

One survey party was employed on the Dubois project running trial lines for a canal location. One of these lines was from St. Anthony to the project; the other was from Island Park Reservoir to the project. A further study of both lines will be necessary.—Barry Dibble.

HUNTLEY PROJECT, MONTANA.

General climatic conditions during August were extremely favorable to the production and harvesting of crops; hot dry weather prevailed, causing a heavy steady demand for irrigation water.

Moss and silt deposits in the reservoir line canal reduced the flow from 30 second-feet to 10 or 12 second-feet and materially interrupted the delivery of water.

Only one crew was employed to keep up the small amount of maintenance work required. The Ruth machine operated continuously and completed practically all the cleaning on laterals A, B, C, and D and was moved to lateral N.—A. R. McGinness.

MILK RIVER PROJECT, MONTANA.

August temperature was above the average and weather conditions favorable for farming, construction, and maintenance operations, but progress was limited by shortage of labor. The second cutting of alfalfa and most of the blue joint hay was in the stack; harvesting, except flax, was practically completed and threshing well under way.

Construction by Government forces comprised excavation by drag lines of waste-water ditch on the Glasgow division making 258 cubic yards per shift and drainage ditch near Dodson making 150 cubic yards per shift, also construction of about 3½ miles of operation and maintenance road on the Bowdoin Canal.

The contractor for Nelson Reservoir enlargement was delayed by equipment breakdowns, but he and seven earthwork contractors on lateral extensions made fair progress. The structure contractor on lateral extensions made only poor progress.

Operation and maintenance included delivering 600 acre-feet of water to 51 water users on the Malta and Glasgow divisions. On the Chinook division about 2,400 acre-feet of water were diverted from the river by the three irrigation district canals. The Ruth dredger was operated 49 shifts, cleaning 6½ miles of laterals on the Glasgow division.—*Geo. E. Stratton.*

ST. MARY STORAGE.

During August weather conditions were favorable for the operation of the St. Mary Canal and the construction work being done.

The storage at Sherburne Lakes Dam amounted to 24,080 acre-feet at the beginning of the month and 9,690 at the end of the month. Only a portion of that released, however, was diverted to the Milk River, the remainder being allowed to flow north into Canada.

The St. Mary Canal was operated the entire month. A total of 24,213 acre-feet was diverted from the Milk River and 18,631 acre-feet was delivered to the North Fork of the Milk River.

Construction work was confined to rebuilding 850 linear feet of canal bank with a force consisting of a foreman and an average of six men with five two-horse teams.

There were no operation difficulties, except a small break in the canal bank on the thirteenth mile, which necessitated lowering somewhat the head being run. The operation and maintenance force, in addition to the assistant engineer in charge, was confined to one gate tender and three patrolmen.—*R. M. Snell.*

SUN RIVER PROJECT, MONTANA.

A severe hailstorm on August 14 did serious damage to crops on the Fort Shaw division, and grasshoppers carried off additional loot.

On the Greenfields division the earthwork contractors made fair progress; shortage of labor interfered with the progress of the structures contractor. A drag-line excavator was received from the Riverton project and started on the drainage work on Greenfields division.

The demand for water was fairly heavy for the first 10 days of the month and very light for the remainder of the month. No deliveries were made on the Greenfields division between the 10th and 31st. Some maintenance work was accomplished in paving Sun River Slope Canal below the first drop into Big Conlee, in repairing the operating road along the canal, and in destroying weeds.—*Geo. O. Sanford.*

LOWER YELLOWSTONE PROJECT, MONTANA-NORTH DAKOTA.

August was an ideal month for construction work and for the harvesting of crops.

Contractors Beauchaine & Kling, under contract 878, made fair progress considering the shortage of labor. As it was impossible for them to hire men and teams to haul sand and gravel their work was concentrated where material was delivered on schedules 4, 5, and 6. The concreting of a siphon on lateral P-3 at station 105 was completed. Contractor Gene Hoffstot, under contract 883, made good progress considering the labor shortage, and practically completed Schedule 3. The Thomas Point pumping plant was completed on August 12. The engineering crew and part of the operation and maintenance force on division No. 2, when not engaged in other work, were constructing a sump for the Ferry Coulee wasteway. Three farm turnouts on lateral extensions were installed.

The maintenance organization was reduced and two ditch riders were laid off on the last day of the month. The work was mostly of routine nature. The Ruth ditch cleaner made good progress, completing the lateral C system and the greater part of the lateral D system. During the month 33,363 linear feet of laterals were cleaned and 7,432 cubic yards of dirt moved.

The second cutting of alfalfa was being harvested and about 75 per cent of grain crops had been cut. Threshing was well under way at the end of the month. Reports received indicated that the yield of wheat and oats will be much above the average, and the quality excellent. Corn was maturing rapidly and root crops made excellent growth. Other than sugar beets, the prices of all farm products declined materially during the month.—*L. H. Mitchell.*

NORTH PLATTE PROJECT, NEBRASKA-WYOMING.

The completed systems of the Interstate, Fort Laramie, and Northport divisions were continued in operation during August. The Interstate Canal was taxed to its fullest capacity on account of the continued drought and unusually warm weather.

On the Interstate division one of the Monighan class 1-A excavators continued the enlarging of the canal north of Fort Laramie Station. One Monighan excavator continued on the Spottedtail outlet channel. A P. & H. drag line No. 206 was employed on the Enterprise siphon at this channel. One Monighan excavator completed an open channel on Winters Creek and was moved to the Gering Valley to begin excavation of a main outlet channel.

On the Fort Laramie division two class 9½ Bucyrus excavators continued on main canal excavation and reached a point about 1½ miles west of Mitchell on this canal. A similar type machine continued the excavation of the Katzer drain. All these excavators were operated two shifts throughout.

A force of about 50 laborers continued the building of miscellaneous lateral structures on the Horse Creek lateral system and completed the North Horse Creek lateral siphon and began the building of a diversion structure for the Main Horse Creek lateral. The major portion of the structure work is being done by miscellaneous contracts of small dimensions.

On the Northport division the building of main canal and lateral structures continued, employing a Government force of about 40 men. A part of this work is also being done by contract. The class 14 Bucyrus excavator continued work on the Indian Creek outlet.

Three Ruth cleaners were at work on the first, second, and third lateral districts, respectively, of the Interstate division, and cleaned a total of 21 miles, excavating approximately 18,500 cubic yards.

The crops are generally very good over the project. The grasshopper plague has considerably abated. The potato crop has been much damaged within the last month by a form of blight or some other disease which has not been definitely identified.—*Andrew Weiss.*

NEWLANDS PROJECT, NEVADA.

August weather was favorable, except that cool weather and heavy rains after the middle of the month retarded the growth of melons and harvest of alfalfa.

The Lahontan power plant was operated continuously from the reservoir until the last day of the month, when a portion of the supply was taken from the Truckee Canal.

The demand for irrigation water was comparatively light, owing to harvesting in progress and precipitation.

Operation and maintenance work was normal until a break in the S Line Canal at about station 232+40 made somewhat extensive repairs necessary and required the shutting of water out of the L and S Canals until August 31, when repairs were completed. As a result of the canal break about 50 acres of melons, potatoes, and other garden truck were flooded.

Construction work on the lateral system was continued to the installation of several minor timber structures and a small amount of excavation in the reconstruction of the P lateral, T system, and the Dalby lateral, V system.

Progress on drainage construction work was excellent. About 223,800 cubic yards of material were removed in construction of approximately 5 miles of new drains. Three Monighan 1 T., one P. & H. class 208, and two Bucyrus class 14 drag-line excavators were in operation on the Fernley, Piute, Carson Lake, Upper Soda Lake, Harmon, and Upper Diagonal drains. The small Austin drag line completed cleaning of Kx lateral and commenced cleaning of Sd drain as operation and maintenance.

The picking and shipment of cantaloupes by carload lots commenced on August 15, one car being consigned to New York on that date from Fernley. At the end of the month 45 cars of Hearts of Gold cantaloupes, averaging about 360 crates per car, had been shipped to eastern markets. In addition, local express shipments to near markets averaged about 100 crates per day. The yield of cantaloupes has been exceptionally heavy, and if frost holds off until the middle of September the optimistic early season expectations for a profitable crop will be realized.

An epidemic of anthrax among stock in the Carson Lake pasture and elsewhere on the project necessitated the vaccination of all cattle in the pasture on August 15. About 1,000 animals were treated. Seventy-one head of stock died in the pasture. Losses were also reported in other localities.—*John F. Richardson.*

CARLSBAD PROJECT, NEW MEXICO.

The weather was extremely hot and dry during August. The total amount of water delivered to the farms during the month amounted to 10,600 acre-feet.

Water was out of the canal during a short period to kill moss, after which a full head was delivered through the canal until the 24th, when both reservoirs were emptied. After the 24th the flow was confined to the river channel below Seven Rivers and dropped gradually from 150 second-feet to about 80 second-feet at the close of the month. One maintenance force was employed the first of the month cleaning laterals and making minor repairs, and during the latter part of the month cleaning E drain of cat-tails and salt cedars.

The general condition of the crops on the project at the close of the month was not so good as the previous month. The hot, dry atmosphere caused considerable deterioration in the cotton fields due to the dropping of the squares. The condition of the cotton crop at the close of the month was estimated at about 74 per cent normal. Owing to shortage of water the fourth cutting of alfalfa hay will be greatly curtailed. About 2,500 acres of alfalfa were left for seed and about 80 per cent of the crop was threshed at the close of the month. The average yield will be about 150 pounds per acre. The price of alfalfa hay advanced to \$15 per ton.—*L. E. Foster.*

RIO GRANDE PROJECT, NEW MEXICO—TEXAS.

Construction work on drains and laterals continued in the Leasburg-Mesilla and El Paso divisions. In the Leasburg and Mesilla divisions, 11 shifts were operated on eight machines. Two Bucyrus 9½ drag-line excavators and one Monighan 2-T drag line excavated 48,600 cubic yards from 0.8 of a mile of drain. One of the Bucyrus machines was moved from the Selden drain near Leasburg to the Montoya area, preparatory to reconstruction of the Montoya drain, and the machine on the Picacho drain was diverted to lateral work. One Bucyrus 9½ continued the construction of the Anthony lateral and two P. & H. 206 excavators continued combined lateral and levee construction, a total of 52,196 cubic yards being placed in 3.3 miles of lateral, while two Ruth ditching machines reconstructed 7.2 miles of lateral.

In the El Paso Valley six shifts were in operation on five machines. Two Bucyrus 9½ and 1 Bucyrus 30-B drag lines excavated 82,471 cubic yards from 1.7 miles of drain. The Ruth ditching machine completed the reconstruction of 3.5 miles of the Clint lateral and the P. & H. 206 drag line cleaned 2.9 miles of the Mesa drain. The two Bucyrus 9½ excavators, one working one shift and the other two shifts made exceptional records, one excavating an average of 1,059 cubic yards per shift at 4.9 cents per cubic yard and the other an average of 1,046 cubic yards per shift at 5.8 cents per cubic yard.

There was no inflow into the Elephant Butte Reservoir during the entire month, the storage depletion being 154,552 acre-feet. Water was delivered for irrigation throughout the month.

Maintenance work consisted principally of cleaning grass and weeds from canal banks and tulies from drains.

The cantaloupe shipments were completed with generally satisfactory results to the growers. The pear crop, which was somewhat less than normal on account of late frosts, was harvested and packed.

Master Mechanic R. N. Owen of the Imperial irrigation district visited the project, inspecting drainage construction and drag-line operation in anticipation of the expenditure of \$2,500,000 for drainage construction in the Imperial Valley.—*L. M. Lawson.*

NORTH DAKOTA PUMPING PROJECT.

With one exception the month of August was the warmest August for 28 years. Temperature and precipitation were both considerably above normal.

Labor conditions became unsettled again, owing to the new settlements with coal labor, the advances in the steel and other leading industries, and the existing railroad strike.

Water deliveries continued from the first of the month to midnight August 19, when the pumping season closed.

The power plant was operated for the commercial power contract in addition to irrigation; 90,150 kilowatt-hours of energy were delivered to the city of Williston, which was 7,250 kilowatt-hours more than in the same month last year.

One thousand seven hundred and sixteen tons of coal were mined.—*Wm. S. Arthur.*

UMATILLA PROJECT, OREGON.

August weather was normal and ideal for farming operations. At the end of the month Cold Springs Reservoir had 4,000 acre-feet more water than at the same time last year. There was enough water supply to finish the irrigation season. The Hermiston

Drain was maintaining a discharge of 70 second-feet to the Umatilla River.

The third cutting of alfalfa was in progress. Baling and shipping of alfalfa were general. Marketing of melons, cantaloupes, honey, and potatoes was in progress. Irrigation was general throughout the month.

Maintenance work consisted of repairs to minor structures and the removal of moss from the canals.

One crew was employed on lateral extension work excavating 650 cubic yards of material and laying 360 linear feet of 16-inch and 1,565 linear feet of 20-inch concrete pipe. Four minor structures were built. There were manufactured 1,460 linear feet of 12-inch, 2,410 linear feet of 16-inch, and 770 linear feet of 20-inch concrete pipe. Advertisements were issued for furnishing gravel and sand for the A canal improvements to be undertaken soon, as well as the hauling of this material.

Selection and conditioning of animals for exhibition at the autumn live-stock shows were engaging the attention of project stock breeders. Optimism was expressed that the high caliber of prize-winning stock shown in the past will be maintained.—*H. M. Schilling.*

KLAMATH PROJECT, OREGON—CALIFORNIA.

August was dry and warm. The demand for water during the first two weeks required a diversion into the main canal of about 650 cubic feet per second; after the 15th the amount was reduced until at the end of the month the flow in the canal amounted to only 120 cubic feet per second.

In the Tule Lake division one drag-line excavator was engaged in building the J canal and the parallel waste ditch. On the lateral system two drag-line machines were employed and toward the end of the month a third machine was placed in operation. A contract was awarded for the construction of timber turnouts and checks for the Tule Lake lateral system for an area of about 7,500 acres. Bids were also opened for constructing some of the minor sublaterals.

On August 31 bids were opened for constructing the west side canal for the Langell Valley division. The work involves the excavation of about 190,000 cubic yards of material. Twelve bids were received, two of which were blanket bids and provided for all or none of the 11 schedules. All of the schedules were also covered by smaller contractors. For the low bids the prices ranged from 14 to 23 cents per cubic yard, for class 1 excavation; 40 cents to \$1.25 for class 2; and \$1.50 to \$2 per cubic yard for class 3.

For the Langell Valley diversion dam fair progress was made in excavating for the river section and for the spillway. Work was also begun on the construction of the embankment on the north side of the river.—*H. D. Newell.*

BELLE FOURCHE PROJECT, SOUTH DAKOTA.

The long rainy season which began in the early part of April came to a close about the 1st of August. Since that date the weather has been very dry and demand for irrigation water has taxed some of the canals to their full capacity, owing to the heavy growth of weeds which had sprung up along the channels and on the banks.

Harvesting and threshing progressed rapidly under most favorable conditions. The yield of small grain was from poor to extra good; the average of wheat as far as reported is around 20 bushels, and some

yields were as high as 50 bushels; others planted late in the season were scarcely sufficient to pay the cost of production.

The second cutting of alfalfa was harvested, and in some cases a third crop was being cut. The yield on alfalfa for the season will be good, but owing to heavy rains a large proportion of the first cutting will be of little feed value.

Repair work in connection with the revetment of the Belle Fourche Dam progressed rather slowly, owing to lack of sufficient labor. The concrete facing was replaced to elevation 2971 and back filling to elevation 2980. The surface of the water stood at elevation 2959.—*B. E. Hayden.*

STRAWBERRY VALLEY PROJECT, UTAH.

August weather was favorable to crop growth; occasional showers materially benefited all crops. The second cutting of alfalfa was over and grain crops were harvested. Early varieties of apples and peaches were on the market. Tomatoes were being picked and shipped to the canneries. The sugar-beet crop was much benefited during the latter part of the month from showers and cool weather.

Delivery of stored water from Strawberry Reservoir continued during the month, and 12,308 acre-feet were released through Strawberry Tunnel. A total of 23,473 acre-feet was delivered to the headgates of the several project canals. Of this amount 11,165 acre-feet were derived from Spanish Fork River. Water deliveries to the High Line division totaled 6,353 acre-feet; to the Spanish Fork division, 15,150 acre-feet; and to the Springville-Mapleton division, 1,970 acre-feet.

The project power plant was in continuous operation, delivering 101,869 kilowatt-hours to the several project towns.—*W. L. Whittlemore.*

OKANOGAN PROJECT, WASHINGTON.

August weather was extremely hot from the first to about the middle of the month, when cool weather prevailed for about a week and then turned very warm again. At the end of the month part of the project was visited by hail, which did considerable damage.

The loss in storage during the month amounted to 4,176 acre-feet, and there was available for use in Conconully Reservoir at the end of the month practically 2,000 acre-feet, which would give about two weeks' run for the entire project. Salmon Lake was pumped down about 7.5 feet, from which pumping 1,565 acre-feet were run into Conconully Reservoir. This pumping has, together with the natural flow of the creek, made about 15 days' water available for the project lands. The gravity system was operated without interruption. The electrical pumps were also operated with little interruption in the service, due principally to line trouble. The entire operation and maintenance force was busy on the regular distribution of water and on other operation and maintenance work. The mechanical force was employed in completing the erection of the second unit of the Salmon Lake pumping plant and in the installation and electrification of the three private wells on the project.—*Calvin Castled.*

YAKIMA PROJECT, WASHINGTON.

August weather was unusually hot and oppressive. Temperature was above normal and precipitation below normal.

Sunnyside division.—Water was diverted continuously, the maximum diversion being 1,306 second-feet; minimum 1,130 second-feet; and average 1,270 second-feet. Ample water was available for delivery to lands under gravity canals and under the pumping plants. The demand was heavy and for the most part deliveries were one and a half measurement. The maximum amount wasted over the Sunnyside Dam was 530 second-feet.

Tieton division.—Diversion was continuous, amounting to an average of 322 second-feet, the natural runoff in the river being ample until the afternoon of the 6th, and storage water was thereafter released from Clear Creek Reservoir to supplement the river flow. At the close of the month all lands were irrigated in good shape, and notice was received from some of the water users to discontinue water service to their lands for the balance of the season.

Storage reservoirs.—Storage was released from Clear Creek Reservoir beginning with the 8th, and from all the other reservoirs throughout the entire month, the total amount released being 159,621 acre-feet, of which about 15,710 acre-feet were wasted in regulation. Clearing work, consisting of piling and burning of logs and debris, proceeded with good progress at Keechelus and Kachess. At Cle Elum the contractor started work on the making of concrete blocks (about 300, size 2 by 2 by 3 feet) for repair of Cle Elum crib dam.—*J. L. Lytel.*

TIETON DAM.

The weather for August was good for construction work. An average force of 510 men was employed. Labor was scarce throughout the month.

One hundred and twenty-three thousand five hundred cubic yards of earth-fill embankment and 1,250 cubic yards of concrete were placed during the month. A small camp was opened for the reservoir-cleaning crew. Cleaning operations, consisting of cutting and piling timber and brush, were carried on in the reservoir area.

Sawmill operations were practically completed.—*F. T. Crowe.*

RIVERTON PROJECT, WYOMING.

August weather was favorable for construction. The roads were in good condition. The flow of Wind River was about normal.

On the Wind River diversion dam 105 cubic yards of reinforced concrete were placed below the headworks. Drag line 121,322 stripped 1,400 cubic yards from the dike site, excavated 4,500 cubic yards for the dam, piled sand and gravel, built cofferdams, etc.; 105 cubic yards of rock were excavated by hand from the cut-off trenches. The plant was erected for completing the dam.

At the Pilot Butte Reservoir site drag line 121,474 continued the excavation of the outlet trench, moving 35,352 cubic yards, of which over half was sandstone.

Drag line 121,323 was transferred to the Sun River project in Montana.—*H. D. Comstock.*

SHOSHONE PROJECT, WYOMING.

August weather was well suited to growing crops. Precipitation was much above normal and consisted of numerous thundershowers, which interfered somewhat with the second cutting of alfalfa.

The construction of Shoshone power plant was practically completed upon the installation of the 36-inch balanced needle valve at the end of the by-pass and the completion of work on the grounds. At the Will-

wood Dam site work was continued on the erection of construction camp and plant. Work on the excavation of the abutments was begun and the class 14 Bucyrus drag line, moved to the head of the Willwood Canal before high water and there electrified, was placed in operation near the close of the month on canal excavation. On the Garland division drainage work was continued with two class 9½ Bucyrus drag lines, one electric and one gas, and one P. & H. one-half cubic-yard machine. On the Frannie division work was carried on by two class 9½ electric drag lines, one class 14 gas drag line, and one one-half cubic-yard P. & H. drag line.—*J. R. Jakisch.*

INDIAN PROJECTS, MONTANA.

BLACKFEET PROJECT.

August weather was on the whole favorable for construction and operation and maintenance work and the maturing of crops.

Construction work was confined to Four Horns Reservoir outlet canal, where one drag line was employed on canal and structure excavation and where one small crew was employed placing concrete drops.

A small amount of water was delivered to farmers on the four divisions of the project.

At the end of the month the harvest was well under way, and the indications were that the crop returns will be fair both on irrigated and nonirrigated sections of the project. The returns will be greater on irrigated than on dry-farmed areas, but owing to the exceptional amount of precipitation there will be no crop failures on the dry-farmed areas.

Some of the crops were damaged by grasshoppers and one or two fields were somewhat damaged by hail, although the damage by hail on the project as a whole was small.—*R. M. Snell.*

FLATHEAD PROJECT.

August weather conditions were excellent.

At the Hubbard Dam stripping of the dam site was continued with the steam shovel located on the east side of the river. About 12,000 cubic yards of loose rock were moved. A machine shop was built and machinery installed. Two centrifugal pumps were set up for unwatering the dam site. A derrick was fitted up to do service as a drag line in excavating mud in the river bed. A contract was let for cement hauling from Marion to the dam at 25 cents per ton-mile.

The excavation of the road from Tabor Reservoir to Lake Kakashe on the Tabor feed canal was completed. The canal below the lake and about 2,000 feet of the canal above the lake were completed. The Bucyrus steam shovel was operated two shifts after the 14th; total excavation for the month, 22,000 cubic yards. Camp was moved at the end of the month to a location along the canal.

Operation and maintenance forces were reduced on account of a decrease in use of water. About 6,500 acre-feet of water were delivered for the irrigation of 8,470 acres of land; 802 turnouts were operated; and 532 miles of canal and laterals used. A severe cloudburst, with hail followed by rain, occurred on the 30th, crossing the upper end of the Camas A canal. A portion of the canal between the tunnel and Mill Creek was completely filled with hail and pine needles and occasional sand and gravel bars. Water running in the canal was forced over the bank, causing a small break.

Officials of the water users' associations of the project met with the director and chief engineer at the

project office on the 18th to discuss water-rental rates and the conditions of the project in general.—*C. J. Moody.*

FORT PECK PROJECT.

August weather conditions were exceptionally good. A number of small showers occurring at regular intervals throughout the month had a tendency to moderate the temperature and greatly benefit growing crops.

Canals and lateral systems were operated on the Poplar and Big and Little Porcupine divisions. The demand was mostly for native grass for fall pasture and hay. The operating forces were employed cleaning canals of water growth and repairing minor structures.

Construction work was confined to the back filling of minor concrete structures on the Big Muddy division. A total of 14 structures were back filled, requiring 140 cubic yards of material.

Harvesting of grain crops was about completed with threshing well under way. Crop yields reported have been fair, averaging about 15 bushels per acre. Labor conditions became serious about the middle of the month, owing to the heavy demand for harvest hands. Wages as high as \$6 per day and board were paid. The third cutting of alfalfa made a good growth and promised to equal that of the second cutting. The potato market was flooded during the early part of the month and very few potatoes were being dug.

Live-stock conditions were very good, as the open ranges are much better than average for this season of the year.—*E. L. Decker.*

GENERAL OFFICES.

Washington office.—Director Davis was in the field the entire month. After visiting the secondary projects in Wyoming, he went to Idaho to stop at American

Comparison between operation and maintenance estimates and results, January 1 to August 31, 1922.

Project.	Gross cost.				Net accruals and revenues.				Area for which water is available.
	Estimate for 1922.		Actual cost to Aug. 31.	Amount * over or under.	Estimate for 1922.		Actual returns to Aug. 31.	Amount more or * less than estimate.	
	Total for year.	To Aug. 31.			Total for year.	To Aug. 31.			
UNDER PUBLIC NOTICE.									
Belle Fourche.....	\$70,000	\$45,000	\$41,000	\$4,000	\$101,153	\$87,000	¹ \$87,000	.....	\$82,500
Boise.....	290,000	192,000	172,000	20,000	290,000	270,000	² 260,000	[*] \$10,000	167,300
Carlsbad.....	52,000	34,000	44,500	*10,500	56,625	48,500	46,000	*2,500	25,000
Huntley.....	45,000	33,000	31,000	2,000	46,500	40,500	30,000	*10,500	30,000
King Hill.....	35,500	18,800	22,000	*3,200	*35,500	18,860	22,000	3,200	16,900
Klamath.....	55,000	46,000	33,000	13,000	*55,000	46,000	33,000	*13,000	51,000
Lower Yellowstone.....	36,000	27,000	19,500	7,500	*36,000	27,000	19,500	*7,500	40,200
Minidoka (South Side).....	94,000	63,500	51,500	12,000	95,300	69,000	83,500	14,500	49,000
Newlands.....	105,000	73,000	84,000	*11,000	121,000	110,000	114,000	4,000	72,200
North Dakota Pumping.....	35,000	27,600	23,000	4,600	*30,820	30,820	30,820	.....	7,650
North Platte (Interstate).....	165,000	133,000	127,500	5,500	166,700	122,000	127,500	5,500	*130,000
Okanogan.....	37,000	28,000	39,500	*11,500	*53,720	44,720	53,720	9,000	8,460
Orland.....	35,000	24,700	20,000	4,700	35,230	29,000	29,000	.....	20,500
Rio Grande.....	231,000	178,000	167,000	11,000	*233,945	180,945	169,945	*11,000	116,000
Shoshone.....	70,000	46,500	44,000	2,500	75,750	70,000	60,000	*10,000	71,100
Strawberry Valley.....	*25,000	16,600	16,200	400	*52,500	32,000	33,600	1,600	59,100
Sun River (Fort Shaw).....	14,600	13,000	10,900	2,100	15,600	13,700	13,700	.....	13,900
Umatilla.....	37,280	25,400	26,000	*600	*37,280	25,400	26,000	600	24,400
Yakima:									
Sunnyside.....	130,000	85,000	84,000	1,000	148,776	114,000	116,000	2,000	103,000
Tieton.....	84,000	52,560	54,500	*2,000	89,800	81,500	78,000	*3,500	32,000
Yuma.....	260,000	(?)	(?)	(?)	262,000	(?)	(?)	(?)	63,200
Total.....	1,905,780	1,162,600	1,111,100	51,500	2,039,199	1,460,885	1,433,285	*27,600	1,183,410
UNDER WATER RENTAL.									
Grand Valley.....	50,000	34,000	33,500	500	50,800	41,000	40,000	*1,000	38,400
Milk River (Inc. St. Mary).....	71,500	50,800	40,300	10,500	22,000	22,000	20,000	*2,000	*74,000
North Platte (Fort Laramie).....	70,000	50,000	41,500	8,500	53,000	45,000	37,500	*7,500	43,400
Sun River (Greensfields and Big Coulee).....	25,000	22,300	17,200	5,100	30,000	27,400	27,400	.....	28,500
Uncompaghe.....	135,000	89,000	105,000	*16,000	142,500	60,000	50,500	*9,500	100,000
Total.....	351,500	246,100	237,500	8,600	298,300	195,400	175,400	\$20,000	284,300
INDIAN.									
Blackfeet.....	30,000	23,000	14,200	8,800	19,700	19,200	6,200	*13,000	21,500
Flathead.....	65,000	48,000	36,600	11,400	58,000	52,000	35,000	*17,000	105,000
Fort Peck.....	14,600	10,800	10,000	800	1,000	750	600	*150	22,400
Total.....	109,600	81,800	60,800	21,000	78,700	71,950	41,800	*30,150	148,900

¹ Based on minimum charge.

² Estimated by Denver office. Figure not shown on project chart.

³ Returns regulated by district contract.

⁴ Includes 17,000 acres for which water is carried in main canal.

⁵ Not including tunnel repairs.

⁶ Includes instalment of \$25,000 for tunnel repairs.

⁷ Chart not received from project in time for publication.

⁸ Stored water is furnished through the St. Mary Canal for 21,600 acres additional.

Falls and then to the Boise project. He visited Emmett, Idaho, the headquarters for the construction of the Black Canyon Dam on the Payette River, where plans for this work were considered, later examining the proposed extensions to the Warm Springs irrigation district on the Malheur River. He also visited the Umatilla and Yakima projects, inspecting the work at Tieton Dam site, and went from there to the Milk River, North Dakota Pumping, Huntley, Shoshone, and Minidoka projects, reaching Salt Lake City on September 1.

During the absence of the director the office was in charge of Assistant Director Morris Blen as acting director.

Chief Counsel Hamel was in the field the entire month, visiting a number of projects in connection with the legal work of the service.

Statistician Blanchard and Photographer Dame returned to the office on August 7 after an extensive photographic trip over a number of the projects to secure motion pictures for the Brazilian exposition.

Manuscript and tables for the Twenty-first Annual Report of the Reclamation Service were practically completed and edited for transmission to the secretary early in September. The statement of assets, liabilities, and capital showed a balance on hand in the Reclamation fund on June 30 of \$4,302,884 and current and contingent liabilities of \$1,048,708, not including \$18,000,000, unpaid balance of the bond loan.

In compliance with the request of Secretary Fall, the Bureau of the Budget approved the publication of the RECLAMATION RECORD in substantially the form in which it appeared prior to the first of the year, so that instead of being issued merely as an administrative and statistical report, it will now be possible to publish in the RECORD articles in the interest of the settlers similar to those published in former years.

At the end of the month approximately 1,500 applications for relief had been filed by individual water users under the act of March 31, 1922.

During the month 135 purchase orders were placed, 12 advertisements issued, and 78 referred to the general supply committee. Purchases amounted to \$4,925.14. The storehouse filled 228 requisitions and made 23 sales from stock, the total value amounting to \$3,211.09.

Publications issued during the month comprised 45 copies of the annual report and 590 miscellaneous publications. The 17 mimeograph jobs amounted to a total run of 8,410 sheets.

The settlement and information section answered 360 inquiries concerning the service and opportunities on the projects. At the end of the month the total number of inquiries from ex-service men concerning opportunities on the land amounted to 194,354.

The photographic laboratory turned out work during the month to the value of \$221.40, distributed as follows: Washington office, \$109.05; field, \$23.60; sales, \$88.75.

Denver office.—During August the chief engineer and the director visited the Saratoga-Encampment projects in Wyoming; the Minidoka, King Hill, and Boise projects, including Black Canyon Dam construction camp, Warm Springs, Baker, Umatilla Rapids, Yakima, Flathead, Milk River, North Dakota Pumping, Lower Yellowstone, Huntley, Shoshone, Dubois, and Provo-Weber projects. Assistant Chief Engineer Charles P. Williams left Denver on August 3 for the Milk River project to meet with consulting Engineer F. W. Hanna and Project Manager George E. Stratton to consider various matters pertaining

to the Milk River project. On August 22 Mr. Williams accompanied the director and chief engineer from the Milk River project to the North Dakota Pumping, Lower Yellowstone, Huntley, and Shoshone projects, returning to the Denver office on August 28. On August 4 Engineer James Munn and Chief Accountant J. M. Lumey met with the director and chief engineer at Walcott, Wyo., to further consider estimates of appropriation for the fiscal year 1924. They returned to Denver on August 5. Engineer Munn left Denver on August 19 for a visit to the Belle Fourche and North Platte projects, returning on August 28.

The principal work accomplished in the designing division during the month consisted of the following: Drawings were prepared for approved design, gravity approaches, Black Canyon Dam, Boise project; design of the Hubbard Dam and trash-rack structure, Flathead project, were revised and completed; preliminary detail designs for the Colorado River crossing of the Orchard Mesa Canal were partially prepared; design for several siphons on the King Hill project were prepared; preliminary designs and estimates for eight earth-fill storage dams and for two diversion dams were prepared for the Lower Platte project; design for right abutment for the Wind River Diversion Dam, Riverton project, were prepared and advertisement and specifications were prepared for the purchase of gates without operating machinery, Willwood Diversion Dam, Shoshone project.

The principal work accomplished in the electrical division consisted of the following: Preliminary design of combined power and pumping plant at Black Canyon Dam, Boise project; purchase of conduit linings and miscellaneous material to be imbedded in the concrete at Hubbard Dam was completed, as well as the designs of emergency gates and valve house, Hubbard Dam, Flathead project; preliminary designs and estimates were prepared covering proposed repairs to the conduit lining in the South Tunnel Outlet, Pathfinder Dam, North Platte project; purchase of air compressor, pump, motors, transformers, and miscellaneous equipment was made for the construction plant at the Willwood Dam, Shoshone project; and revised preliminary design and estimated cost of Santaquin pumping plant, Strawberry Valley project, were made. Bids for the 36-inch screw pump were opened and recommendations for award made. This pump will be purchased for use on the Yuma project.

The cost and property division arranged transfers of equipment and materials amounting to \$52,934.24, and sales to private parties aggregated \$73.26.

The more important matters considered by the legal section were: Furnishing water to Harlem Water Users' Association during the present season, notwithstanding delinquency in payment of charges for last season, Milk River project; application of Murtaugh Irrigation District to use Augur Falls power site, Minidoka project; and damage claim of P. A. Preult, Rio Grande project.

D. P. Hogan, president of the Federal Land Bank of Omaha, Nebr., visited the Shoshone project recently to examine the project and help in the organization of a local association for the placing of Federal farm loans. The proposed rate for Federal loans is 6½ per cent, as compared with 8 to 10 per cent asked by private agents.

ADMINISTRATIVE ORGANIZATION.

DEPARTMENT OF THE INTERIOR.

HON. ALBERT B. FALL, Secretary of the Interior.
 EDWARD C. FINNEY, First Assistant Secretary.
 FRANCIS M. GOODWIN, Assistant Secretary.
 EDWIN S. BOOTH, Solicitor for the Interior Department.
 CHARLES V. SAFFORD, Administrative Assistant to the Secretary.
 MORGAN R. BROCK, Assistant to the Secretary.
 HARRY G. CLUNN, Private Secretary to the Secretary.
 JOHN HARVEY, Chief Clerk and Superintendent of Buildings.

U. S. RECLAMATION SERVICE.

WASHINGTON, D. C.

Arthur Powell Davis, director; Morris Blen, assistant director; Ottomir Hamel, chief counsel; J. B. Beadle, director's assistant; C. J. Blanchard, statistician; Hugh A. Brown, editor and office assistant; C. A. Bissell, engineer; J. M. Luney, chief accountant; C. A. Lyman, repayment accounting; Miss H. A. Fellows and Raymond Depue, fiscal agents; C. H. Fitch, chief clerk; Emmet Carr, purchasing agent; G. W. Numbers, appointment clerk; H. N. Bickel, Yakima, Wash., and W. F. Kubach, Great Falls, Mont., examiners of accounts.

DENVER, COLO.

F. E. Weymouth, chief engineer, Tramway Building, Denver, Colo.; R. F. Walter and C. P. Williams, assistant chief engineers; Miss L. H. Mcisel, secretary to the chief engineer; J. M. Gaylord, electrical engineer; J. L. Savage, designing engineer; James Munna, engineer; W. A. Meyer, chief clerk; A. McD. Brooks, purchasing agent; Harry Caden, fiscal agent.

FIELD LEGAL OFFICES.

Boise, Idaho.—B. E. Stoutemyer, district counsel. Projects: Boise, Minidoka, King Hill, and Jackson Lake Enlargement.

Denver, Colo.—Law section office of chief engineer: R. M. Patrick and Armand Offutt, district counsel.

El Paso, Tex.—P. W. Dent, district counsel. Projects: Rio Grande, Carlsbad, and Hondo.

Las Cruces, N. Mex.—Mark B. Thompson, attorney in charge of litigation on Rio Grande and Carlsbad projects.

Helena, Mont.—E. E. Roddis, district counsel, Helena, Mont. Projects: Blackfeet, Flathead, Fort Peck, Huntley, Milk River, St. Mary Storage, Sun River, North Dakota Pumping, Lower Yellowstone, and Shoshone.

Mitchell, Nebr.—J. N. Beardslee, district counsel. Projects: North Platte, Belle Fourche, and Riverton.

Montrose, Colo.—J. R. Alexander, district counsel. Projects: Grand Valley, Uncompahgre, and Strawberry Valley.

Portland, Oreg.—H. L. Holgate and D. G. Tyree, district counsel. Projects: Yakima, Okanogan, Umatilla, and Klamath.

San Francisco, Calif.—Brooks Fullerton, district counsel, 349 Pacific Building. Projects: Salt River, Yuma, Orland, and Newlands.

PROJECT ORGANIZATION.

Belle Fourche Project.—B. E. Hayden, project manager, Newell, S. Dak.; R. C. Walber, chief clerk.

Boise Project.—J. B. Bond, project manager, Boise, Idaho; Walter Ward, engineer in charge construction Black Canyon Dam; E. R. Mills, chief clerk; C. F. Weinkauff, fiscal agent.

Carlsbad Project.—L. E. Foster, project manager, Carlsbad, N. Mex.; V. L. Minter, chief clerk and fiscal agent.

Grand Valley Project.—S. O. Harper, project manager, Grand Junction, Colo.; C. H. Young, chief clerk; A. H. Hall, fiscal agent.

Huntley Project.—A. R. McGinness, project manager, Ballantine, Mont.; G. H. Bolt, chief clerk; Miss M. C. Simek, fiscal agent.

King Hill Project.—A. M. Rawn, project manager, King Hill, Idaho; T. W. Hause, chief clerk; W. S. Gilgoly, fiscal agent.

Klamath Project.—H. D. Newell, project manager, Klamath Falls, Oreg.; N. G. Wheeler, chief clerk; G. R. Barnhart, fiscal agent.

Lower Yellowstone Project.—L. H. Mitchell, project manager, Savage, Mont.; C. A. Denman, chief clerk.

Milk River Project.—G. E. Stratton, project manager, Malta, Mont.; H. A. Parker, engineer; E. E. Chabot, chief clerk; G. S. Moore, fiscal agent.

Minidoka Project.—Barry Dibble, project manager, Burley, Idaho; Dana Templin, engineer; E. C. Diehl, chief clerk; Miss A. J. Larson, fiscal agent; F. A. Banks, engineer, American Falls, Idaho.

Newlands Project.—J. F. Richardson, project manager, Fallon, Nev.; A. W. Walker, engineer; G. B. Snow, chief clerk; Miss Ethel M. Simmonds, fiscal agent.

North Dakota Pumping Project.—W. S. Arthur, project manager and chief clerk, Williston, N. Dak.; H. C. Melaas, fiscal agent.

North Platte Project.—Andrew Weiss, project manager, Mitchell, Nebr.; H. W. Bashore, engineer, Fort Laramie Division; Paul Rothi, irrigation manager; J. R. Ummel, chief clerk; Miss A. L. Perrine, fiscal agent.

Okanogan Project.—Calvin Casteel, project manager, Okanogan, Wash.; W. D. Funk, chief clerk and fiscal agent.

Orland Project.—R. C. E. Weber, project manager, Orland, Calif.; E. T. Erikson, engineer; C. H. Lillingston, chief clerk and fiscal agent.

Rio Grande Project.—L. M. Lawson, project manager, El Paso, Tex.; T. W. Parry, irrigation manager; C. A. Peavey, chief clerk; L. S. Kennelcott, fiscal agent.

Riverton Project.—H. D. Comstock, project manager, Riverton, Wyo.; R. M. Conner, engineer; G. H. Murphy, chief clerk; Miss Grace M. McCarthy, fiscal agent.

St. Mary Storage Division.—R. M. Snell, project manager, Brownings, Mont.; F. H. Shiner, chief clerk and fiscal agent.

Salt River Project.—Being operated by the Salt River Valley Water Users' Association; C. G. Cragin, general superintendent and chief engineer, Phoenix, Ariz.

Shoshone Project.—J. S. Longwell, project manager, Powell, Wyo.; J. R. Iakisch, engineer; C. M. Jump, superintendent of irrigation; W. F. Sha, chief clerk; Miss L. C. Drinkwater, fiscal agent.

Strawberry Valley Project.—W. L. Whittemore, project manager, Provo, Utah; J. E. Overlade, chief clerk and fiscal agent.

Sun River Project.—G. O. Sanford, project manager, Great Falls, Mont.; H. W. Johnson, chief clerk; Miss M. G. Valentine, fiscal agent; G. A. Benjamin, irrigation manager, Fairfield, Mont.

Umatilla Project.—H. M. Schilling, project manager, Hermiston, Oreg.; G. O. Patterson, chief clerk and fiscal agent.

Uncompahgre Project.—L. J. Foster, project manager, Montrose, Colo.; R. B. Smith, chief clerk.

Yakima Project.—J. L. Lytel, project manager, Yakima, Wash.; R. C. Cunningham, chief clerk; J. C. Gawler, fiscal agent; M. D. Scroggs, superintendent of irrigation, Sunnyside, Wash.; J. S. Moore, superintendent of irrigation, Route 6, Yakima, Wash.; F. T. Crowe, engineer in charge construction Tieton Dam, Rimrock, Wash.; C. F. Gleason, engineer; V. G. Evans, chief clerk; C. B. Funk, fiscal agent.

Yuma Project.—P. J. Preston, project manager, Yuma, Ariz.; R. M. Priest, superintendent of construction; S. A. McWilliams, engineer, Yuma Mesa Division; E. R. Scheppelmann, chief clerk; E. M. Philebaum, fiscal agent.

INDIAN PROJECTS.

Blackfeet Project.—R. M. Snell, project manager, Browning, Mont. F. H. Shiner, chief clerk and fiscal agent.

Flathead Project.—C. J. Moody, project manager, St. Ignatius, Mont.; S. A. Kerr, engineer in charge construction Hubbard Dam; J. M. Swan, chief clerk; J. P. Siebenelche, fiscal agent.

Fort Peck Project.—E. L. Decker, acting project manager, Poplar, Mont.; Henry Berryhill, chief clerk and fiscal agent.

SHORT STORIES OF SUCCESSFUL SETTLERS.

Gathered from the Project Press and People.

By C. J. Blanchard, Statistician.

OUR journey from San Francisco to Portland after a Fourth of July in the bracing air of the Bay City will ever remain a painful memory. It was a 24-hour experience in Gehenna. An upper berth in a crowded train through the torrid heat and dust of Sacramento Valley is not conducive of comfort. The atmosphere was shrouded in dense smoke from many fires which hid the distant mountains and the pleasant valley farms. We caught no glimpse of the glories of Shasta, Hood, or Rainier on the trip. The Siskiyou and the Cascade Mountains were invisible and our lungs were filled with the acrid smoke which veiled the landscape for a thousand miles or more of the trip.

Arriving at Yakima in the early morning we were met by Project Manager Lytel, who whisked us quickly up the valley and into Tieton Canyon, where Engineer Crowe, of Arrowrock and Jackson Lake fame, is now very much in evidence on a whale of a job—the construction of the Tieton rock-fill dam. Crowe, as usual, was out on the job when we arrived at headquarters, so that we had time to wander around camp pending his return. Immediately in front of the main office building is a large bulletin board which chronicles the progress of each shift on the work. Above the daily record, in large letters we read the camp slogan, which later we found to characterize the spirit of the camp. It reads: "To hell with excuses—get the muck."

After a Delmonico lunch with the big mess our cameras were loaded in the car and we proceeded up the river to the scene of the great work. From the depths of a profound canyon an amazing mass of rock and earth is rising slowly. Its dimensions are startling and its construction thrilling. Tieton Dam is to be 321 feet high, 905 feet long on top, and 1,150 feet wide on the bottom. Its mass content will be 1,850,000 cubic yards. Viewed from the rim of the canyon the construction work is absorbingly interesting. At night under the glare of myriad electric lights the scene would have inspired the imagination and descriptive powers of Doré. A babel of noises fills the canyon with echoes. The creak of cranes, rattle of cableway chains, the chug-chug of dinkey engines hauling long trains of cars, the crash of the jets of hydraulic giants smashing into the rocks washing down silt and sand, the grinding of huge shovels on gravel or stone, the thunder of T. N. T. explosives, followed by shock and roar of mountain sides tumbling into the river at the midnight hour, call to mind an inferno peopled by a thousand fiends darting here and there amid the gloom. Rock, gravel, sand, clay, and silt of every

size and degree of fineness are transported, sorted and delivered in place under a plan which makes the operation almost automatic. The mountain sides are blasted and are being washed into the dam. Across the center the narrow wedge of concrete which forms the corewall is rising slowly from bedrock. Against its upstream face the hydraulic giants are washing down a wide deposit of clay silt almost as fine as talcum powder. As it settles the water is passed off in a tunnel through the cliffs around the dam. Lying next to this mass of impermeable "goo" the materials in the upstream portion of the dam range from sand and gravel to the coarse rock which will form the outside face. Below the corewall the materials are sand, gravel, and rock of various degrees of fineness and porosity. A half mile upstream we witnessed the operations of a great bucket on a cableway scooping gravel from the river bed and carrying it to the laundry to be washed and sorted.

The camera man registered one failure, but nobody was blamed for it, even if regret was general that no picture was obtained. He tried to film at the close range of 200 feet the explosion of 1,200 pounds of T. N. T. He had a companion with him, but he was not the writer. It was the fellow who let off the charge, and he was behind the photographer.

The explosion was not in itself terrifying, but the aftermath certainly was. After a dull rumble the steep mountain side seemed to lift and then spring outward. At this instant the whole face of the cliff was hidden in a dense black smoke in and out of which forked flames darted. Then came a rain of sand and small rocks which hid everything from view. Out of the chaos the two men finally emerged covered with dust and with minor bruises, but with no photograph to reward their daring.

The motion pictures are being arranged to illustrate the methods of construction and should have considerable educational value for engineering schools and colleges.

We spent a day in the valley with Project Manager Lytel and the board of directors. It was a regular party. Getting together frequently with the project manager to thresh out their problems is the practice of the board, and it makes for efficiency and harmony. The farmers on the Yakima are now aware that the operation of a great public utility like the Yakima project is a man's size job, and they are preparing themselves for the day when they must assume the varied and difficult responsibilities which will confront them. We traveled from Yakima to

The Reclamation Record

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OCTOBER, 1922



First prize, agricultural exhibit, won by Tieton View district, Yakima pr

Wash., at Washington State Fair.

Prosser, through the richest valley in the Northwest, and it was a pleasure to note the cordial manner in which the various needs and requirements of the project were considered.

Another day was devoted to the "Hill Billies," those Tieton fellows whose perpendicular farms are the wonder of the country. Their orchards are on such steep slopes that there is talk of doing the spraying from airplanes. Some of the farms are so nearly perpendicular that they might be sprayed from the rim of the canyon with a little more power on the pumps.

The ditch riders on this project, where so many buried pipe lines carry the water to the farms, have to use a map to locate the turnouts.

No finer picture can be found anywhere than Tieton Bench, with its wonderful orchards burdened with luscious fruits. It was the time of ripe cherries when we were there, and the trees were bending with a heavy load of Bings and Lamberts, which later delighted the palates of the effete East. Any time you feel inclined to question the worthwhileness of national reclamation we recommend a visit to Yakima Valley.

There is something about Flathead Valley, our next stop, which holds you in a spell. Nature has been lavish in the gifts of scenic charm and beauty, in fine climate, and fertile soil. The inspiration of the lofty mountains, which almost completely inclose the valley, the enjoyment of countless tumbling streams, numerous lakes, and the lure of big woods which cover the slopes are all found there. For the home-seeker the broad valley is a land of boundless opportunity, abundantly responsive to industry and intelligent effort. Agricultural progress here has been slow, largely because the farmers are too few and for the reason that many are not measuring up to their opportunity. More real advance has been shown during the past 2 years, however, than in the preceding 10, and the signs are propitious that the valley is now on a forward swing which will soon bring it to the position where it belongs—the Yakima of Montana. We enjoyed two days with Project Manager Moody, one of which was occupied in the rather strenuous task of ascending Mission Creek to the foot of Elizabeth Falls. It was a seven-hour hike through a tangled wilderness of fallen trees and heavy underbrush, but it was worth the effort. The scenery was superb and Elizabeth Falls is now in the movies for the first time. Some day horseback trails will wind upward to these heights of beauty; perhaps the engineer will dare to open the way to the auto gypsy and then will be made accessible one of the grandest mountain regions in America. We drove clear around Flathead Lake over a fine State highway, and visited many charming villas on its rock-bound shores, summer homes of citizens of Butte, Anaconda, and Missoula. There was one unforgettable day on Flathead—

the day of the Masonic picnic. In the big pine forest above Kicking Horse headgates on Post Creek, a merry throng of farmers, town folks, and their families gathered for a day of rest and social relaxation. The cosmopolitan character of the valley's population was revealed here, for we met people from more than 15 different States. It was a delightful occasion, and our enjoyment was not lessened by the very sumptuous repast which was set out by the ladies at the noon hour.

Mindful of the limitations of space we shall leave for another issue the story of our tour in Milk River Valley and our delightful experience in the Black Hills, the Switzerland of America.

What Others Have Done, You Can Do.

Salt River project, Arizona.—Although some farmers did not make any money on alfalfa seed, others did. Gust. Johnson, a rancher living west of Chandler, had in 17 acres of alfalfa seed, second cutting, planted in the spring of 1921. It was a poor stand and he replanted in the fall of the same year. The first cutting was made in the spring of 1922 and the second cutting he permitted to go to seed. The seed yield was phenomenal, going 601 pounds to the acre. He got a total of 62½ seamless sacks, weighing 10,300 pounds, which sold on the ranch for \$11.65 per 100, amounting to \$1,199.95. This gave him \$70 an acre gross or a net profit of \$50 an acre.

Orland project, California.—Anchorage farm won in a competitive bid against the best Berkshire breeders in the county for the sale of a Berkshire boar to the United States Government for the pens at Fort Stanton, N. Mex. Mrs. H. A. Hardy, manager of Anchorage farms, received word of the success of the local farm in competition on sealed bids with the rest of the breeders of the country.

The present almond harvest is probably the largest in the history of the industry in the project. With new orchards coming into bearing yearly, the volume of the crop will begin to mount very fast from this time forward. Practically all of the local growers with the exception of one or two of the acreage of 20 or 40 acres are now members of the association. It is likely that the total crop of almonds this year in this section, including members of the association and nonmembers, will total over 200 tons, no small item of revenue.

Minidoka project, Idaho.—W. B. Clayton, living 2 miles east and 1 mile south of Rupert, is an advocate of more good dairy stock in that section. He has kept a close record on the two good Jersey grade cows he has been milking and finds that he is getting big returns from his butterfat.

Records kept on one 7-year-old Jersey for three full months show that during that period she gave 3,951 pounds of milk testing 4 per cent, equaling 158 pounds butter fat, which brought, at 33 cents, \$52.14. He used the 494 gallons of separated milk that was left, valued at 6 cents per gallon, totaling \$29.64. During this period the animal was fed 1½ tons of hay, figured at \$8 per ton, or \$14; 736 pounds of grain, at \$1.75 per 100, or \$12.88. His profit on this cow for the three months was \$54.70.

His 3-year-old Jersey gave 3,214 pounds of milk in four full months. This tested 4.5 per cent, making 144.64 pounds butter fat, sold for \$47.72. Left after

the milk was separated were 400 gallons which were used for feeding calves, hogs, etc., valued at 6 cents per gallon, or \$24. The cow was fed nothing but alfalfa, eating 2½ tons, or \$20 worth, which leaves a profit of \$51.72.

"More of our farmers should be milking good cows," says Mr. Clayton.

Flathead Indian project, Montana.—Oswald Felsman, who lives near St. Ignatius, seeded 23½ acres to wheat and irrigated 6½ acres of the field. On the 6½ acres he threshed 171 bushels and on the remaining 17 acres he threshed 158 bushels. The increased yield from irrigation was 17 bushels per acre. The ground was the same on all parts of the field.

J. M. Doyle, near St. Ignatius, fall irrigated his land before seeding his winter wheat in 1921 and got a perfect stand. This year he threshed 35 bushels per acre where others got from 5 to 12 bushels per acre. He has irrigated another 80 acres this fall, using 40 acre-feet of water costing him \$20, and says he can get 40 bushels per acre next year.

J. J. Corrigan, out at Round Butte, returned to his farm in 1919 and found it well seeded to mustard and Russian thistle. The ground was rather steep and to the natives appeared hard to irrigate. This did not discourage "Corrugating" Corrigan. He seeded 50 acres to alfalfa and raised a good crop of spring wheat to boot. Also built himself a large house and barn, all the first year. Last fall he turned under 5 acres of his alfalfa land just to demonstrate what improvement the alfalfa has made in the soil and raised crop of spring wheat. He recently threshed out 56 bushels per acre.

Newlands project, Nevada.—The Holstein Freisian Association, which keeps a very close tab on the milk production of this breed of dairy stock, has recently referred in highly complimentary terms to the records of four members of the Longheath herd of the Newlands project, which are given herewith:

La Polka De Kol Queen Pietertfe No. 439587, four years one month old: Butter, 7 days, 33.94 pounds; milk, 7 days, 644.5 pounds; milk, 30 days, 2,703.9 pounds; butter, 30 days, 126.06 pounds.

Golden Valley Esther Ormsby No. 418106, four years six months old: Milk, 7 days, 657.9 pounds; butter, 7 days, 35.74 pounds; milk, 30 days, 2,713.7 pounds; butter, 30 days, 136.85 pounds.

Segis De Kol La Polka No. 415245, five years two months old: Milk, 7 days, 723.5 pounds; butter, 7 days, 29.86 pounds; milk, 30 days, 2,939.2 pounds; butter, 30 days, 111.3 pounds.

La Polka Omaha Mabel De Kol No. 309383, six years old: 365 days, 23,377.1 pounds milk with 1,010.6 pounds butter.

The first and fourth cows shown above are full sisters and are daughters to a full sister of the last cow on the list, which has a yearly record exceeding 1,000 pounds of butter. Registered Holstein herds with medium to good production are common, but such records as reported here can be only the result of years of careful selection and breeding. Cows with ability to produce 1,000 pounds of butter fat are rare, indeed, and the Newlands project is certainly to be congratulated on having such animals in its midst. With the excellent blood and the alfalfa hay of this valley, Mr. Long has been able to develop a bunch of heifers from this noted herd sire, King Ormsby Johanna, that promises to be the equal of any lot of dairy heifers that any one breeder of the entire country can boast of.

William Balgoyen, in the Sheckler district, made a practical test of strawberry culture this season, and his experience may serve others. He set out 1,500 Progressive Everbearing strawberry plants May 20, costing \$22.50, occupying a plat of ground 50 by 50 feet. On the 7th day of July he commenced picking. He has picked 16 cases of 20 baskets each, for which he received \$3 per crate, or a total of \$48, with many still to be picked.

In addition to this, he figures that he can sell about \$60 worth of plants from the runners the coming spring.

Mr. Balgoyen says they will stand no alkali whatever and need a sandy soil. Where he used fertilizer from the horse barn the plants were burned up, but the fertilizer from the cow barn proved highly beneficial. The everbearing strawberries are well adapted to this climate and will yield abundantly. Those produced by Mr. Balgoyen are large and of very fine flavor.

There would seem to be an opportunity for quite an industry in raising and shipping local strawberries where care is taken in selecting the right soil and giving the berries proper care.

The season's shipments of cantaloupes, mostly to the far East, ran up to more than 100 carloads, and the Newlands famous Hearts of Gold topped the market always. Fernley district holds the palm for the heaviest yields, some of which averaged above 400 crates per acre. The range of prices has been from \$2.25 to \$3 per crate. The future outlook for this young industry is most encouraging.

Carlsbad project, Mexico.—The C. C. Lewis farm in the Otis district this year made a remarkable record in the growing of Indian corn. On his place is a silo of 100 tons capacity, and Mr. Lewis cut sufficient ensilage from 3½ acres of ground to more than half fill the silo. The ensilage is prepared by taking the entire plant, corn, stalk, and fodder, and cutting them up into one mass, which is placed in the silo and allowed to ferment.

Rio Grande project, New Mexico-Texas.—The Rio Grande project occupied many pages of the local press just before and on September 29, the Farmers' Day at El Paso. Enthusiastic scribes covered the valley from Fabens to Rincon, and gathered a wealth of interesting stories of crops and farms, and the daily papers of El Paso were profusely illustrated with photographs showing the bumper crops, the fine stock, and homes of many of the successful farmers. The newspapers of the valley have always shown great interest in agricultural development, which is, of course, the basic industry and the foundation of the valley's prosperity and economic strength.

H. M. Dillon, who is working one of Dr. R. F. Hare's farms, walked off with the premier prize for the first bale of cotton grown and ginned in Dona Ana County this season.

The bale of 510 pounds was bought by W. A. Sutherland for the First National Bank of Las Cruces at 25 cents a pound, or \$127.50 for the bale. The premium, contributed by business men of Las Cruces, amounted to \$88.60, or a total of \$216.10 for the bale.

L. I. Mayfield won the second prize of \$44.30 with a 501-pound bale, which was sold to R. P. Porter on a bid of 21½ cents a pound. A. J. Brook's bale of 474 pounds was sold to B. C. Collier on a bid of 21½ cents. The premium on Brook's bale was \$14.10.

Mr. Dillon has 50 acres in cotton, which, he figures, will mostly make a bale an acre.

Mr. Mayfield says his cotton will also go a bale or better an acre.

It is estimated that the project will show nearly double the cotton crop this year over last, with a substantial gain in price. The returns are likely to exceed \$1,000,000.

A national poultry show will be held in Liberty Hall December 11 to 16, inclusive, it was announced by T. H. Ellis, secretary of the El Paso Poultry Association, which has planned the exposition.

A hundred raisers are expected to enter their best chickens. Plans include arrangements for 1,000 fowls to be in the exhibit pens.

Ducks, geese, turkeys, and cultivated wild birds will be in the exhibits, but chickens will receive most of the attention. Thirty or more varieties of hens and roosters will be recognized by the judge.

Cash prizes and trophies, such as silver cups and ribbons, will be rewarded to the winners in each class.

The purpose of the show, according to Mr. Ellis, is to increase the standard of birds raised in the El Paso district and to increase the egg production.

The expense of the last poultry show, which was held in January, 1921, was approximately \$2,200.

The "arid" Southwest, thanks to reclamation and irrigation, does not have to depend on Florida and other coast sections for its melon supply. It grows its own.

N. A. Gehl had 5 acres in "pink meat" cantaloupes this year. He has been advised by the agency which handled his crop in Chicago, Ill., and Pittsburgh, Pa., that his 50 acres netted him \$12,000. He did not send his entire crop to the agency.

But at that he realized \$240 an acre on the "pink meats" furnished the East and North. His crop was handled in conjunction with the yellow meated cantaloupes and the "honey dews" raised in the Mesilla and Rincon Valleys.

The agency had contracted to use the production from about 700 acres planted to "pink meats," but the acreage was unavoidably cut down, according to M. C. O'Hara. The agency wants not less than 1,500 acres planted to "pink meats" for its handling next year. The entire cantaloupe acreage of the valleys this year was about 3,000 acres.

Umatilla project, Oregon.—On his big alfalfa ranch a mile south of Hermiston, Col. J. F. McNaught is having constructed a modern system of sheds for the housing of his herd of brood sows which at present number 52.

The houses consist of six units, each unit being made up of eight pens, which are 6 by 12 feet in dimension and are floored half the length. The units are arranged in rows, three on either side with passage-way down the center. The partitions in the pens are of the sliding panel form, and when these are removed the whole unit can be thrown into one large pen 12 by 48 feet. Removable guard rails of 2 by 6 are placed in each individual pen, and these are also easily removed when not in use. Water is piped to the houses from a storage tank.

At this writing Mr. McNaught has 52 brood sows, 14 of which have farrowed with a total of 130 young.

Yakima project, Washington.—The State herd at Fort Steilacoom was augmented last month by one of the project's fine Holstein Freisian dairy cows purchased by Governor Hart for the Western Hospital.

More than 2,600 tons of Bartlett pears have been canned by the McNeil & Libby plant, of Yakima, this season. As far as is known, this output exceeds any one cannery in the world.

As high as 70 tons a day have been canned, which is a national cannery record. The bulk of the crop has been from the Yakima Valley and brought from \$40 to \$55 a ton to the growers. The minimum price received by the growers is \$104,000.

Canning of cull apples is in progress. The crop this year is not as large as that of the 1921 season. For the most part culls have been bringing between \$5 and \$6, with a few extra quality crops ranging above the maximum.

Shoshone project, Wyoming.—For several years the Powell High School has been encouraging the organization of boys and girls clubs in agricultural and other lines. Recently a team composed of Wynn Clark, Stanley Kreps, and Edgar Markley, in competition with 10 other teams at the State fair, won first honors as a team in the live-stock judging contest. Wynn Clark won the highest individual rating and Stanley Kreps was awarded third place among all the contestants.

RECLAMATION PROJECT FAIRS.

DURING September agricultural fairs were held on a number of the projects or in their vicinity. The Sixth Glenn County Fair was held at Orland on September 18-23. Westside and Lake Farm Centers, located on the Orland project, were awarded first and second prizes for farm-center agricultural exhibits. An agricultural fair was held on September 15 and 16 at Fairfield, on the Sun River project, and an excellent showing was made of agricultural products and stock from the irrigated farms. A similar exhibit was planned for Simms on October 7.

The Richland County Fair was held at Sidney, on the Lower Yellowstone project, on September 19-21, and the agricultural exhibits were exceptionally good. It was also reported that many prizes were taken by Richland County farmers at the State fair at Helena. Mr. C. P. Adams, of the Umatilla project, secured first and place awards on exhibits of Duroc hogs at the Oregon State Fair. Preparations were being made on this project for the Annual Hermiston Hog and Dairy Show on October 6 and 7.

The Utah Annual State Fair was held at Salt Lake City on October 2-7. Utah County, in which the Strawberry Valley project is located, had its usual well-balanced display of agricultural products. The Northwestern Wyoming State Fair was held at Powell, on the Shoshone project, on September 4-7 and was very successful.

The Tieton division of Yakima project again carried off honors at the annual Washington State Fair, held in Yakima on September 18 to 23, inclusive, in the district agricultural exhibits from Yakima County. First place went to the Tieton View district and second place to Naches Heights. Competition between

the two districts was very close. Both exhibits attracted a great deal of attention and favorable comment, but Tieton View won out by reason of the greater variety of its products, which included apples, pears, prunes, apricots, peaches, grapes, berries, honey, vegetables, corn, and grains. (See front page of this issue.) All these products are raised on land which

12 years ago was devoted to sagebrush and jack rabbits. The exhibits were planned by the community clubs of the respective districts.

It is interesting to note that third place went to the Wapato district of the Yakima Indian Reservation, which is in charge of the United States Indian Service.

PROJECT WOMEN AND THEIR INTERESTS.

By Mrs. Louella Littlepage.

The Ghost What Ain't.

A WRITER in a current magazine makes one of his characters say, "It's the ghosts what ain't that I'se a-skeered of." Every woman has her "ghosts what ain't," chief among them being one to the effect that some day the world is going to discover she is growing old. Time was, not so many generations ago, when the dark ages had not really passed for women. In those days it was a mark of breeding to be "delicate," and in those days it *was* a tragedy to lose one's good looks.

By a curious mental twist known to psychologists as the "fixed idea" some women still make the plucking of eyebrows, the abolishing of wrinkles, the retention of a willowy figure of prime importance, but the saving grace lies in the fact that most of them now recognize health as a far more potent factor in producing an attractive appearance than lotions, plasters, and rouge.

As proof that they are going about their work in an intelligent manner, one has but to read a few current issues of various newspapers. Witness the activities, for instance, at the fairs now in progress on the Government projects. Every day spent at one is an education in time and labor saving, in hygiene, food preparation, etc. There is a radical departure from time-honored displays in the marked absence of centerpieces and china painting and fancy pillows and useless articles. Instead educational demonstrations of many arts of interest to women are made with illustrative objects on exhibition.

There are model kitchens in some places with all kinds of electrical devices and demonstrators in charge. Visitors are shown how to do their dusting and sweeping effectively with so little labor that they may, if they feel called upon to do so, leave home at times to do a little civic sweeping. Some fairs have modern kitchens scientifically designed to save steps, and furnished with new and up-to-date utensils and conveniences.

There are day nurseries where the women may park their babies in safety while they enjoy the other exhibits, and where they may be shown how

to properly bathe and feed the 'little chaps. There are model living rooms and laundries; in fact, practically every room in the house has its innings at these fairs, each carrying its own valuable suggestion from the art of table setting and the making of a bed to selecting pottery and hanging pictures.

Under the auspices of the Home Economics Clubs women are shown how to cut and make men's shirts without basting, as done in the ready-to-wear factories. And the fine arts are not neglected. The popular decorative stitches, which transform a dress into a gown, are taught to those who wish to learn, and instructions are given in creating millinery at home that looks as though it came from a French shop. Dress forms, how to make and use them, crocheting and rug making, basketry and lamp shades, and rare decorative flowers of various materials are all demonstrated. All the actual operations in upholstering and refinishing old furniture were literally taught at one fair.

While we still have a hankering for the gorgeous display of handicraft of the old days, there is not a question but that the modern way has its points. The fair is no longer merely an entertainment, a display of elaborate useless articles, fashioned during many long hours of painstaking labor and eye strain; it is a school. Instead of simply displaying the things they know well how to make, the women are taught scientific and time-saving methods of every stage of their craft. They learn how to furnish and ventilate a bedroom that will put more roses in their cheeks than dollars worth of rouge. They learn how to prepare attractive, balanced menus which will keep their figures youthful to the end of the chapter. They learn how to operate labor-saving devices which will leave them ample time for study and recreation.

Oh, yes, the women still have their ghosts, but they are fast learning how to "lay them."

An official of the Reclamation Service on a recent visit to Newell, Bellefourche project, South Dakota, was attracted by the marked improvement in home

yards and public streets, and particularly by the flower beds at street intersections. Inquiry revealed the fact that the Women's Civic League was responsible for these and other community improvements. Mrs. B. E. Hayden, president of the league, has sent the following comments on their work to the RECORD, which are full of valuable suggestions:

In the successful management of all small towns there are some matters of public welfare which can be more successfully handled by women working together than in a mixed club. With this thought in mind, the women of Newell, S. Dak., met in the proverbial schoolhouse one evening early last spring and organized the Women's Civic League. In reality it is a very simple organization, with few regulations, but dominated by the one idea of service to our community.

We divided the club into committees, with a chairman for each who is responsible for the work of her committee; though in emergencies we combine committees as seems best.

1. We have a city beautiful committee, whose duty it is to supervise the care of our park, encourage by contests the cultivation and care of flowers, lawns, window boxes, etc. They have also planted flower beds at all the principal street intersections. Each member of the league pledges to keep her own premises in a strictly and sanitary condition.



Type of street markers provided at Newell, S. Dak., by the Women's Civic League.

2. A play-grounds committee for the benefit of the children.

3. A sick and benevolent committee whose duty it is to visit any one sick, also the hospital, carrying flowers or reading matter, and report anyone needing help.

4. A fair committee, who sees that we are represented at the county fair by some exhibit. This year we captured a prize.

5. A sanitation committee, whose duty it is to see that weeds are cut, garbage disposed of, etc.

6. Tourist park committee: We have put a great deal of effort on this work this year, first in selecting a suitable site, and, with the help of the Commercial Club, erecting a very creditable building 24 by 30 feet, screened, wired, and equipped with stove, tables, etc. In this the women and men cooperated. The men nailed the boards and the women donned overalls, brought their lunch, and made a day of it painting the building. It was fun as well as work.



Building erected in Tourist Park through the public spirit of the women of Newell, S. Dak.

7. A cemetery committee, whose duties are familiar to all. We plan to plant 1,000 bulbs this fall.

We try to interest the boys and girls in our work and supplement the work of the Commercial Club when possible. We served luncheon on Arbor Day, when the Commercial Club planted 1,500 trees; at another time supper was served to the men who mowed the park and cultivated the trees.

For this winter we have divided into three departments, namely:

1. Study Club.
2. Parent-Teachers' Club.
3. Music and Dramatic Art Club.

These will occupy us while it is too cold to work out of doors.

We have not accomplished all that we had planned, but with a membership of 70 we expect to do a great deal next year, and we feel that we have been of some service to our town.

The women of the Nampa Century Club, Boise project, Idaho, served dinner two days during the harvest festival week, and the proceeds will go into the club's building fund. This organization is working toward the establishment of a community center, where all civic organizations may meet and community entertainments be given. In outlining the

scope of the coming year's work the president, Mrs. P. W. Duffes, said welfare and community activities would come first. There has developed a sentiment for a physical training division, and the matter is under investigation and study.

The Rupert Woman's Club, Minidoka project, Idaho, recently planned a library drive. On Sunday Good Reading was the subject of sermons in the churches. On Monday the club members started out to collect and expected that every citizen of the town would donate either a book or its equivalent.

The library already has 4,500 volumes. The first of the month one citizen donated 125 books, and a local milliner gave 5 per cent of the September sales. Included in its contents are 40 volumes of 1922 fiction. There is little doubt that the present drive will be a most successful one, and the women deserve commendation for what they have already accomplished in making the library an institution the town is proud of.

At the Minidoka County Fair, held in Rupert recently, the Business Women's Club had a "fish pond" running a little over an hour, taking in \$75.

Woman's Club to Chaperon School Social Activities.

At a recent meeting of the Rupert Woman's Club it was suggested by the social committee that club members lend their support to the school faculty, with especial reference to chaperoning entertainments and parties. Having received the hearty indorsement of the school superintendent, it was decided to have committees appointed to confer with class advisors in this regard, as well as to assist in the arrangement and entertainment of school parties.

A gigantic musical club is in process of formation in El Paso, and it is hoped by those actively interested that 10,000 people will join. There are to be auxiliaries to the club, each auxiliary to be of a nationality. For instance, the French people will form one group, the Greeks another, Italians another, and so on. Five hundred enthusiastic boosters had signed up before the meeting for final plans was held. One need not necessarily be a musician to become a member; just a desire to further musical interest is all that is required.

Mrs. W. C. Outlaw, of El Paso, Rio Grande project, has been experimenting in horticulture and incidentally showing the farmers of that district just what

the soil will produce when properly handled. She believes that 8 feet is a record six months' growth for a grape cutting, and recently exhibited vines of that length which were planted in February of this year.

It is not over 2 feet in Mrs. Outlaw's yard to caliche that is almost impenetrable, some places not over 15 inches, yet her fruit and vegetables make record growth. Peach and plum trees have grown about 5 feet from spring settings. Rooted figs set last spring produced ripe figs in September. Vegetables and melons grown in her yard this year and last include beans, peas, radishes, tomatoes, lettuce, turnips, beets, carrots, onions, oyster plant, rhubarb, cantaloupes, watermelons, and Irish potatoes.

Many of the women on the Yakima project, Washington, are taking advantage of the millinery classes which are being conducted at Yakima and other towns of the county through the county agent. Evening classes will be held as well as the daylight sessions, so that women who are otherwise employed during the day may have a chance to receive the benefits of the course.

Having in mind the great difficulties in the way of shipping facilities this fall, the Home Economics Club of Yakima recently held a home products show, where among other exhibits they demonstrated the preparation of many delicious dishes in which the principal ingredient was apples. As "A prophet is not without honor save in his own country," so a home-grown product, no matter how superior, is usually rather scorned as a steady diet. Dressed up in some of the delightful forms invented by these clever women a large part of the fruit which otherwise would be wasted is sure to be consumed by native Washingtonians in the future.

Mrs. J. W. Danielson, Newlands project, Nevada, enthused a local editor when she brought to his office from her ranch 3 miles from town a basket of fine peaches. He pronounces them the largest and finest he has ever seen. Several of the peaches weighed three-quarters of a pound each, and some of them measured 11 inches around. Mrs. Danielson stated that they did not smudge their trees and only sprayed once, but they intend to both smudge and spray next season.

As evidence that the fame of our project women is not confined to their immediate section, the Providence Journal, Rhode Island, recently published the following:

It is four years since the first woman council was returned to office in Umatilla, Oreg. In three years they have worked wonders. Umatilla, a railroad

town and the center of a prosperous farming and timber country, was in 1919 almost bankrupt. Three thousand dollars of warrants had been issued, whereas the charter permitted an issuance of \$2,500. The fire system was \$1,500 in arrears. Delinquent interest on \$20,000 in water bonds was due. One by one the street lights were being turned off because the city light bill had not been paid. School attendance was far below what it should have been.

One winter's night there was a stormy political meeting, at which no citizen could suggest a solution until some one suggested letting the women do the work. They nominated women whose records as mothers, wives, and home makers were unimpeachable. They were elected in March, 1919. They've been reelected by large majorities at two subsequent elections.

Their accomplishments are worth listening to. With \$28,000 indebtedness staring them in the face they have reduced the town indebtedness to zero and can boast of \$2,000 in the treasury. They have raised the moral tone of the town until there is no longer need for a jail in Umatilla. They have graded the streets and improved the schools. The community is an example of decent town rule.

This town is on the Umatilla project, Oregon, and it might be mentioned that the first woman mayor was formerly a resident of another Government project, Mrs. Laura J. Starcher, who moved to Umatilla from Parma, Boise project, Idaho.

A New Bureau.

Secretary of Agriculture Wallace has made an announcement of unusual significance to both farm and city women. He said that ultimately he has in view making the home economics work an independent bureau, ranking with the other bureaus of the department. The bureau chief will be a woman of executive ability, thorough scientific training, and a broad and sympathetic understanding of what is needed to make such a bureau most helpful to the women of the country.

The Secretary said that work for women had grown steadily in the department. In 1915 what has been called the office of home economics was created as part of the extension service. A great deal of attention has been given to studies of foods and how best to use them, labor-saving devices for the home, studies of dressmaking and materials, etc. Work of this sort is planned primarily for the help of women on the farms, but much of it is equally as helpful to women in the cities, and especially to those of moderate circumstances who must exercise economy and get the greatest value for the money spent.

The woman chief of the proposed new bureau will rank with the chiefs of the other bureaus of the Department of Agriculture, attend the weekly conferences in the Secretary's office, and thus bring the woman's viewpoint into the general work of the department.—L. L.

WILLIAM E. SMYTHE, 1861-1922.

WILLIAM ELLSWORTH SMYTHE, one of the earliest apostles of national irrigation, died at his residence in New York City on October 6, at the age of 61 years. Mr. Smythe was a native of Worcester, Mass., but for more than 30 years has resided in the West. In 1890, while editing the *Enterprise* at Kearney, Nebr., he became interested in the subject of reclamation. His trenchant editorials, articles in *Scribners*, *Harpers*, and other periodicals, attracted attention and laid the foundations of a western organization out of which grew the National Irrigation Congress at Salt Lake City in 1891. Through the medium of this congress public sentiment was crystallized and finally resulted in the enactment of the reclamation law of 1902.



William E. Smythe.

For more than a quarter of a century his undivided efforts were given to the promotion of a constructive policy of home-making in the West. In 1908 he initiated the Little Landers movement in California, which resulted in the colonies of San Ysidro, Tajunga, and Runnymede.

During the World War he was called to Washington and was immediately associated with the late Secretary Lane in developing a plan of soldier-settlements for the returning veterans.

Mr. Smythe was a scholarly writer and an eloquent speaker. Among his numerous books, *Constructive*

Democracy, The Conquest of Arid America, and his latest book, City Homes on Country Lanes, are most widely known.

His early demise will occasion much regret in the West, where his friends are legion and his unselfish and untiring services are appreciated.

THE-END-OF-THE-RAINBOW RANCH.

By C. J. Blanchard, Statistician.

IN pursuit of the elusive dollar during 20 years of my life I served in many capacities," said Benjamin F. Spittler, the owner of one of the prize ranches on the Minidoka irrigation project in southern Idaho.

"For more than a dozen years as an employee of the Standard Oil Co., first in my native State of Pennsylvania and later in many parts of North America, I was engaged in drilling, wildcatting, and scouting for oil. The game was exciting, but a poor one for a home-loving man with a good wife, so I quit it and joined a western railway company, finally landing the job of division superintendent of the bridge and building department."

It might be observed that these vocations fitted Mr. Spittler for the profession of farming about as well as scientific instruction in tatting is calculated to graduate high-class electricians. After trying his hand at farming for a short time in Colorado and liking it, Spittler came to the Minidoka project in 1908 and bought a relinquishment from one of the original entymen.

"Want to know what cinched our selection of this project as a future home?" asked Spittler. "A good many things, of course, were considered, but the real determining factor I believe was cheap electricity. That answer surprises you and apparently indicates a lack of practical sense from a farmer's standpoint; but let me explain: We thoroughly investigated the lands and crops all over the project, talked with Government officials and many farmers, and inspected the irrigation system, but came to no final decision. One evening we supped at a ranch house lighted with electricity. Mrs. Spittler discovered that her hostess had prepared an excellent supper on an electric range, and that settled it. From that time on it was 'Minidoka for ours.'"

"We had no preconceived notions about farming, but had decided in our own minds that first of all we would try our luck on a small farm close in. My ambition was toward intensive rather than extensive agriculture. I wanted no more land than I could cultivate myself, and from the start our crop system has been planned accordingly.

"The climate, soil, and growing season here are excellently adapted for our plan. Everything favors specializing, and the adoption of scientific farming methods in seed selection and cultivation.

"It was not all easy sailing, however; we made a lot of mistakes in the beginning. My predecessor had not exerted much effort on the ranch, and what he had done was mostly wrong. I had the usual experience of the pioneer in hewing a farm out of the desert. The handicap of inexperience was partly overcome by seeking advice from successful neighbors and from Government officials. Slowly we gained in knowledge, and a steady improvement in the condition of the ranch encouraged and stimulated us to greater effort. Then came a period of depression and discouragement, due to the serious rise of ground water which threatened the destruction of all our crops. Our part of the project occupied an area known as subirrigated. The soil was so porous that irrigation was extremely simple. We had only to turn water into the ditches and then watch its rise in our fields. When the soil became saturated up to the roots of the plants we merely closed down our headgates until time for the next irrigation. It was a lazy man's method of irrigation, and we were inclined to commiserate the lot of the other farmers on the project who were compelled to lead the water over their fields. The ease with which our work was accomplished bred carelessness and resulted in waste of water. Higher lands began to fill up and drain into our fields, which in turn became water-logged and unproductive. I saw my alfalfa slowly drowning, and my orchard began to show signs of sickness. Things were mighty discouraging until the Government completed a comprehensive drainage system and drew down the ground water. Our wet lands came back to normal crop production in a surprisingly short time, and from that time forward the project made remarkable progress.

"The newcomer on the project is quick to note a quality in the social makeup of our people differing from that which exists in most agricultural communities. The project is really a big community enterprise. We are all linked closely together by reason of our joint and equal ownership in a great public utility—the \$6,000,000 irrigation and power plant which we are buying from the good old Government.

"As we have recently taken over the management and operation of our canal system, we are brought together frequently in a business way. We have become more than mere toilers on the land. Our vision has broadened. We have had to develop leadership

and take hold of business affairs with which the average farmer rarely has any concern.

"Naturally this experience has pushed us into many lines of cooperation and organized effort. Why, do you know there are 25 mutual electric power companies on this project, distributing electricity to more than 1,200 farmers, and owned and managed by farmers? Then, there are cooperative cheese factories, cold-storage plants, dairy and hog associations, and numerous organizations devoted to the welfare of the farmers here.

"Think of the transformation wrought here since 1906, when this country was a 'desert: More than 2,300 farm homes established; 6 towns with a population of 9,000; 28 public schools; 29 churches; 2 sugar factories; an alfalfa-meal mill and potato-flour plant; and many other industries.

"Our school system is the best in the State and ranks with the best in the country. Owing to the compact settlement of the land (the farm units average in size 50 acres) and our excellent graveled roads we have graded and high schools located in the towns. To these schools our country children are brought in autobusses and returned to their homes at night.

"The children of the farm and town are being schooled together, and we believe this results in keeping the farmers' boys and girls on the land after they grow up. Being educated in town affords them opportunity of contrasting the lives of the urban folk with their own, and the lure of the city is greatly lessened. As we are living here to-day our farmers enjoy the same conveniences, and most of the luxuries, of our friends in town, besides having the freedom and independence of the country. We have completely done away with the chief bane of the country—isolation and loneliness. Country life here is sufficient and therefore satisfying.

"Minidoka farmers are specializing in their crops. Experience has shown us that we can produce certain special and high-priced crops for which a profitable market exists. A ready market is offered in the Middle West for our clover seeds, red and white, alsike, and alfalfa. Vermont and other Eastern States, where the canning industry is important, pay us premium prices for our peas and beans, because of perfection of type and high germinating qualities. Our two big sugar factories grind up the stored sweetness of our 7,000-acre beet crop and pay us \$1,000,000 a year for it. Our corn, barley, and succulent alfalfa fatten thousands of sheep, cattle, and hogs, and make prosperous our dairies.

"Abundant sunshine, water stored in the snowy Tetons 200 miles away, and a soil of volcanic ash 20 feet deep are waiting to respond to intelligent husbandry. Can you beat this anywhere in the world?"

When Ben Spittler, standing on his bluegrass lawn shaded by ornamental trees, and backed by his vine-

covered bungalow, begins thusly to sing the praises of Minidoka lands, you just naturally yearn to have a part in this progressive, forward-looking community.

You have just been touring over miles of shaded, graveled country highways, crowded with autos and trucks, passing hundreds of charming farmhouses, glimpsing pleasing vistas of alfalfa, grain in shock, potatoes, and sugar beets. Apparently the fecund earth has erupted a million haystacks. You have viewed the bustling young cities of Burley, Rupert, Paul, and others, all electrically lighted and heated, and all established since 1906. With these convincing, eye-filling evidences of natural wealth and prosperity before you, there is no disposition to discount the glowing statements of the enthusiastic Spittler.

With pardonable pride he shows the visitor about the ranch. It is, indeed, a revelation—a splendid example of careful and intelligent planning. Every foot of its 63 acres is put to wise use in alfalfa, sugar beets, potatoes, barley, bluegrass pasture, orchard, garden, buildings, and yards. The farm is stocked with registered Jerseys, headed by a prize bull, Duroc hogs, and chickens, turkeys, and ducks.

The live stock consumes all the grain, hay, beet tops, and garden surplus, converting them into butter fat and meat. Ground barley, with alfalfa, constitutes a well-balanced ration for the stock. With the exception of potatoes and sugar beets, nothing is hauled off the ranch except the cream. The skim milk goes to the calves, pigs, and poultry, in addition to the waste in the fields and feed lots. The ranch furnished all the meat, fruit, and vegetables in abundance for home consumption, reducing the expenditures in town to a minimum.

Enrichment of the soil has resulted from the frequent application of stable manure, and as a result the yield of crops is 50 per cent more than the average for the whole project. Mr. Spittler has a record of 3,500 bushels of potatoes from 5 acres and 90 bushels per acre of oats. All crops are rotated. In replanting alfalfa on land which produced oats, he usually sows in the oat stubble, immediately after the grain is harvested. By this means he has secured three cuttings of hay for the next year, instead of one cutting usually obtained from a spring sowing.

The small orchard furnishes ample fruit for the household and apples are made into cider, of which a quantity is sold annually.

The farm buildings consist of a modern bungalow set amidst fine trees, a large barn, two concrete garages, machine and blacksmith shops, concrete milk house, fruit cellar, and other improvements. Truly, this may be called "an electric farm." Every known labor-saving farm device that can be operated by power is found here.

In the blacksmith shop a 1-horsepower motor is used to drive the forge blower; in the machine shop a $\frac{3}{4}$ -horsepower motor is installed, which through a

jack shaft drives grinders, pumps, and a feed chopper; a rectifier charges the batteries of the autos and trucks; darkness is dispelled in the yards by a 400-watt lamp suspended from a tall pole. All of these buildings are lighted by electricity.

The bungalow has little need for chimneys, because it is electrically heated. Four electric heaters, with a capacity of 9 kilowatts, and operated by simple switches, do the trick. In the domain of the wife electricity is her handmaiden. Her cooking is done with it; its power turns the churn, washing machine and sewing machine, fans, and cream separator; it heats the flatiron, curler, and heating pad; it operates the vacuum cleaner. Almost we forgot to mention that an electric dinner horn calls the workers to meals from the distant fields.

Well may we inquire, How many homes in the great cities are so fully equipped as this modest little ranch house out in sunny southern Idaho?

The electric supply is from the lines of the Rural Electric Co., a corporation of farmers distributing electricity to 70 farm families on 21 miles of 2,200-volt power lines. This power is obtained from the Rupert substation of the United States Reclamation Service. The rates charged stockholders in this company explain the general use of power on these farms. They are as follows:

- 5 cents per kilowatt hour for the first 25 kilowatt hours per month.
- 3 cents per kilowatt hour for the next 125 kilowatt hours per month.
- 1 cent per kilowatt hour for all over 150 kilowatt hours per month.

The average monthly cost is about \$4 for electricity, exclusive of heat. The latter costs about \$1.25 per kilowatt per month, or a total of approximately \$60 for the heating season. At the present price of coal on the project this would buy only 4 tons.

Spittler's investment in lines (paid for by the purchase of stock in the mutual company), transformers, wiring, electrical equipment and appliances, has been over \$1,200. According to him, this is the best investment he has made on the ranch. His entire expenditure for improvements is estimated at \$150 per acre. Was such a heavy outlay wise? It surely was, and this is substantiated by numerous offers of would-be purchasers. Three years ago a buyer appeared and offered \$48,000 for the property, or \$762 per acre. As Spittler tells it: "That looked like an awful lot of money, and I was sorely tempted to close out. Mrs. Spittler wasn't one bit interested, but, as a compromise, suggested we lease the ranch for a year and make a trip of investigation. We stocked the auto with gas and oil and started on a tour, in which we visited every large irrigation project in the West, and then we came back satisfied that the Minidoka ranch home was good enough for us. This is the 'End-of-the-Rainbow Ranch.'"

Data on the Aswan Dam, Egypt.

The Reclamation Service has recently received data in regard to the Aswan Dam on the Nile from the Assistant Undersecretary of State for the Department of Public Works of Egypt, which it is thought may be of interest to readers of the RECLAMATION RECORD.

The volume of water stored in the reservoir is taken as the amount conserved over and above the natural river. The dimensions of the reservoir thus depend on the condition of the natural river, which is determined by the reading of the Halfa gauge, this gauge being outside the influence of the dam.

The length, area, and volume of the reservoir are given in the following table for readings of Halfa gauge. This includes all conditions of the river experienced in the periods when the reservoir is used:

Halfa gauge.	Length of reservoir.	Area of reservoir.	Capacity of reservoir.
<i>Feet.</i>	<i>Miles.</i>	<i>Acres.</i>	<i>Acre-feet.</i>
0.82	198.84	68,940	2,282,100
3.28	193.25	67,460	2,187,300
6.56	188.28	65,730	2,051,900
9.84	181.44	63,750	1,911,600

The maximum height of the Aswan Dam from mean foundation level to top of parapet is 98.4 feet. (It is noted, however, in Engineering News for September 30, 1909, page 340, that the maximum height of the dam from the very lowest foundation is 146.8 feet.)

The length of the dam crest is 6,398 feet; the volume of masonry in the dam, including locks, is 1,203,268 cubic yards.

The following references in the technical press describing this dam and the construction work in connection with increasing the height of it, 1909-1912, are given:

- Heightening the Assuan Dam across the Nile; Engineering News, Sept. 30, 1909, vol. 62, pp. 339-344.
- The Assuan Dam; Engineering Record, Jan. 11, 1913, vol. 67, p. 29.
- Completion of the rebuilt Assuan Dam; Engineering News, Jan. 23, 1913, vol. 69, pp. 143-144. (See also for articles on the old Assuan Dam, Eng. News, Dec. 28, 1899, p. 418; Sept. 26, 1901, p. 221; Aug. 15, 1902, p. 106.) (See also an article entitled "Egyptian Irrigation and the Assuan Dam," in London "Engineering," Dec. 20, 1912.)
- Condition of the Assuan Dam; Engineering Record, May 24, 1913, vol. 67, p. 565.
- Raising the Assuan Dam; Engineering Record, June 28, 1913, vol. 67, pp. 725-728.
- The struggle for the Nile; American Review of Reviews, Dec., 1920, vol. 62, pp. 607-617.

Proceeds from Federal farm loans on Orland project property are being received each month. At the close of June 30 there had been 107 applications for loans made through the Orland Federal Farm Loan Association and 73 loans amounting to \$205,700 had been made.

COEFFICIENTS OF DISCHARGE FOR SUPPRESSED SUBMERGED ORIFICES.

By Julian Hinds, Engineer, U. S. R. S.

IN 1914 F. W. Hanna, at that time supervising engineer, United States Reclamation Service, suggested that a series of experiments be conducted on submerged orifices with contractions partially suppressed. The object primarily sought was the development of a measuring device free from obstruction by silt. Accordingly tests were conducted at Boise in 1914 and 1915 on two types of orifices in various sizes. In the first tests contraction was suppressed on the bottom only, the orifice opening being set flush with the floor of the structure, but it was later decided to suppress the ends as well as the bottom, thus avoiding the tendency of silt to accumulate in the corners of the orifice box. Experiments were conducted upon both types over a wide range of conditions, and the notes are on file in the Boise office. The orifice with side and bottom contractions suppressed is believed to be preferable in silty waters and only the notes for that type are herewith discussed. The general arrangement and dimensions of the experimental structure for a 1 by 4 foot orifice are shown in figure 1. Other sizes of orifice were obtained by building false sides in the original structure, as indicated by dotted lines in the figure, the length of the structure remaining constant.

It was originally thought that measurements for head should be taken entirely above and below the structure, and hook gauges were accordingly installed in positions A and B. Figure 2. As a rough check, ordinary enameled weir scales were installed at points 1, 2, 3, and 4. The hook gauges were placed in stilling wells, connected with the canal by pipes, and were carefully read. The scales were set in the open channel and were read as closely as could be done, considering the motion of the water. At times the scale readings were only estimates of the mean of a fluctuation of a tenth of a foot or more. The discharge was measured volumetrically in a concrete-lined tank.

After the measurements were completed the notes were worked up and coefficients of discharge were computed. The coefficients obtained from the hook gauge readings were very irregular. This might have been expected, except that the phenomenon of recovery of head had not been gone into in any considerable detail at that time, and its effect under varying stages upon the hook-gauge readings was not foreseen.

Coefficients based upon the loss of head between various scales were also computed and the results obtained from scales 3 and 4 were found to give reasonably consistent results, notwithstanding the

adverse conditions under which the readings on these scales were taken. However, the fact that the velocity of approach was an appreciable and variable factor in the tests as conducted was overlooked, with the result that certain observations appeared to be irregular. The data were therefore abandoned and no further attempt made to develop the suppressed orifice.

Recently Assistant Engineer W. G. Steward, who conducted the original experiments, has suggested that the matter be taken up again and the data re-analyzed, as shown in the accompanying tables. The present analysis differs from the original analysis only in the allowance for velocity of approach. Ordinarily, in weir and orifice installations, a pool is provided to reduce the velocity of approach to such an extent that it will not appreciably affect the discharge. In silt-bearing waters this pool is rapidly filled up, and the accuracy of the measuring device is destroyed. In the suppressed orifice the velocity is intentionally increased upstream from the opening to avoid the deposition of silt, and the velocity of approach must be taken into account in the preparation of tables and diagrams if accuracy is required. It will not be necessary to use the velocity of approach, as such, in the field, but proper allowance must be made in the preparation of diagrams and tables. A typical diagram for a 1 by 4 foot orifice is shown in Figure 3.

Experiments were made upon six sizes of orifices, and the results for each size are shown separately in the accompanying table. It will be noticed that the average discharge coefficient varies from 0.610 for the 0.5 by 2 foot orifice to 0.645 for the 1 by 2 foot size.

It was expected originally that the coefficient of discharge would vary in some manner with the ratio of unsuppressed to total perimeter, and this theory seemed to be borne out in a general way by the diagram, Figure 4. No explanation could be made for the apparently low coefficient obtained for the 0.5 by 1 foot orifice. It now appears that the suppression of the end contractions eliminates the effect of length and that discharge depends upon other factors than the shape of the orifice.

In studying the data a number of diagrams have been prepared in the hope that some method of analysis capable of taking care of all variable factors might be found. Figure 5 probably gives more consistent results than any other arrangement tried. In this figure, L represents what may be termed the "apparent loss," which is obtained by subtracting the velocity head through the orifice, assuming a uniform velocity, from the observed value of H , and Δh_v is

the velocity head through the orifice minus h_{v1} . The diagram is based upon the assumption that the coefficient of discharge should not be applied to that part of the velocity represented by the velocity of approach. The five points for the 0.5 by 1 foot orifice, which apparently fell out of place on Figure 4, are shown solid in Figure 5, and show no marked irregularities. The assumption that L computed as directed above represents a loss of energy is not strictly true, since the velocity a short distance downstream from the orifice probably approaches the theoretical velocity, and the actual loss in energy is small. When further experiments have been made it will probably be possible to improve upon this figure.

It should be noted that most of the coefficients given in the accompanying tables are lower than usually recommended in text-books for suppressed orifices, and on that account they should be used with caution. Nevertheless, it is believed that the data are sufficiently reliable to warrant their use temporarily in the measurement of water for irrigation.

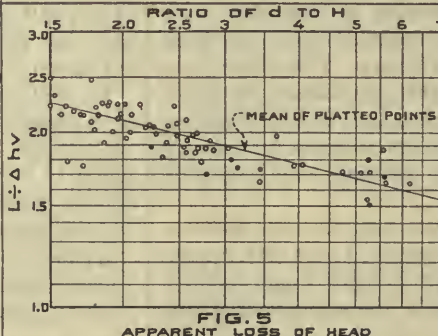
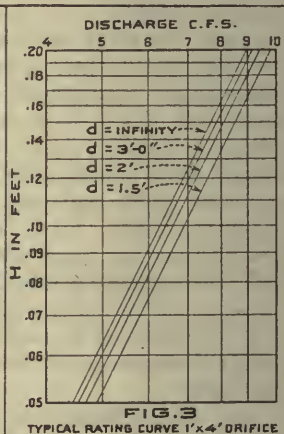
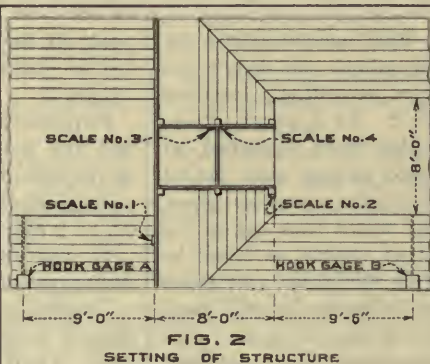
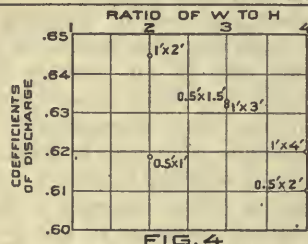
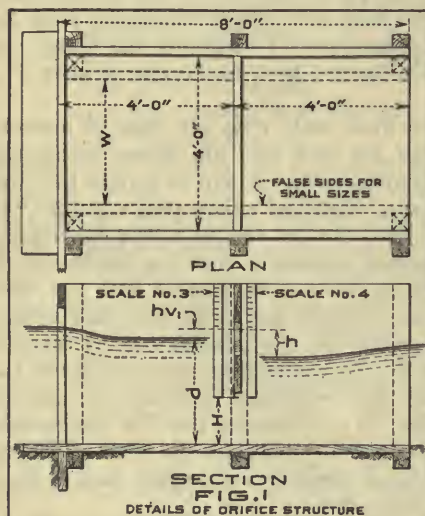
In working up the tables all observations involving a measured head of less than 0.1 foot were excluded because of the rough method used in taking readings, as previously noted. Readings taken with the orifice "free" or unsubmerged were also excluded.

It is hoped that the suppressed orifice can be developed into a very useful measuring device, especially

applicable to locations where head is limited or silt interferes with the operations of the overfall weir. Additional experiments should be made as soon as possible to develop a dependable formula for discharge and to determine the proper dimensions for the structure. The effect of the length of structure on the discharge was not investigated at Boise. It is probable that the flume can be ended immediately below the orifice. The minimum permissible length upstream from the orifice can be determined only by trial. The proper point for measuring the head also needs to be determined. The lower head should probably be measured immediately below the orifice, and for experimental purposes both heads should preferably be measured in stilling wells with hook gauges. Connections to the stilling wells probably should enter the channel above the elevation of the top of the orifice opening.

Projects having facilities for conducting experiments of this kind, or desiring to make a trial installation for practical use, should present their requirements to the Denver office, so that plans fitting in with the work being done elsewhere can be furnished to them.

All of the field observations and a large part of the computations in connection with the above experiments were made by Assistant Engineers W. G. Stewart and D. J. Paul, of the Boise project.



DEPARTMENT OF THE INTERIOR
UNITED STATES RECLAMATION SERVICE
BOISE PROJECT - IDAHO
EXPERIMENTAL SUBMERGED ORIFICE
W. G. STEWART AND D. J. PAUL
1914 - 1915

3-C-35

Coefficients of discharge for suppressed submerged orifices.

1 BY 4 FOOT ORIFICE.

Observation.		Scale readings.		Observed head.	Velocity head.	Corrected head.	Theoretical discharge.	Observed discharge.	Coefficient of discharge.
Series.	Run.	No. 3.	No. 4.						
1	6	0.822	0.720	0.102	0.014	0.116	10.93	6.90	0.631
	7	.852	.730	.122	.015	.137	11.87	7.40	.623
	8	.902	.750	.152	.018	.170	13.23	8.18	.618
	9	.973	.780	.193	.021	.214	14.83	9.25	.623
	10	1.080	.815	.265	.025	.290	17.28	10.58	.613
	11	.775	.475	.300	.040	.340	18.70	11.44	.612
	12	.895	.555	.340	.040	.380	19.79	12.22	.617
	18	1.690	.523	1.167	.062	1.229	35.60	21.57	.606
	19	2.020	.990	1.030	.044	1.074	33.30	20.38	.612
	20	1.700	1.240	.460	.026	.486	22.40	13.85	.618
10	23	.730	.525	.205	.032	.237	15.62	9.99	.639
	15	1.010	.625	.385	.037	.422	20.85	12.52	.600
	16	1.590	.705	.885	.053	.938	31.08	19.10	.615
	17	1.790	.747	1.043	.056	1.099	33.62	21.27	.632
	18	1.630	.730	.900	.051	.951	31.30	19.12	.611
	23	.824	.720	.104	.014	.118	11.02	6.97	.632
	24	.990	.785	.205	.023	.228	15.32	9.61	.627
	25	1.185	.840	.345	.031	.376	19.70	12.23	.622
	26	.970	.775	.195	.021	.216	14.92	9.11	.610
	27	1.075	.805	.270	.027	.297	17.50	10.99	.628
Oct. 1914.	28	1.490	.890	.600	.039	.639	25.65	15.77	.615
	29	1.775	.925	.850	.044	.894	30.35	18.66	.615
	30	1.542	.885	.657	.041	.698	26.80	16.62	.620
	31	1.582	.900	.682	.042	.724	27.30	17.00	.622
	32	1.723	.916	.807	.045	.852	29.60	18.57	.627
	33	1.222	.842	.378	.032	.410	20.55	12.69	.613
	34	1.380	.880	.500	.037	.537	23.50	14.64	.623
	35	1.260	.850	.410	.033	.443	21.35	13.16	.617
	36	1.288	.860	.428	.034	.462	21.81	13.49	.618
	Aver.								.620

1 BY 3 FOOT ORIFICE.

2	5	0.502	0.380	0.122	0.028	0.150	9.33	6.05	0.648
	6	.542	.390	.152	.033	.185	10.35	6.74	.651
	7	.600	.410	.190	.038	.228	11.50	7.51	.653
	8	.650	.415	.235	.043	.278	12.68	8.25	.650
	9	.705	.415	.290	.048	.338	14.00	9.00	.643
	10	.800	.420	.380	.056	.436	15.91	10.26	.645
	11	.927	.425	.502	.062	.564	18.10	11.52	.637
	18	.901	.797	.104	.012	.116	8.21	5.05	.615
	19	1.145	.860	.285	.024	.309	13.38	8.07	.603
	20	1.575	.900	.675	.039	.714	20.35	12.22	.601
	21	1.490	.895	.595	.037	.632	19.13	11.54	.603
	Aver.								.632

Coefficients of discharge, etc.—Continued.

1 BY 2 FOOT ORIFICE.

Observation.		Scale readings.		Observed head.	Velocity head.	Corrected head.	Theoretical discharge.	Observed discharge.	Coefficient of discharge.
Series.	Run.	No. 3.	No. 4.						
3	2	0.560	0.290	0.270	0.060	0.330	9.22	6.13	0.665
	3	.618	.285	.333	.074	.407	10.24	7.08	.691
	4	.720	.260	.460	.086	.546	11.86	8.07	.680
	5	.860	.200	.660	.092	.752	13.90	9.05	.651
	6	.500	.290	.210	.052	.262	8.22	5.48	.667
	16	.715	.587	.128	.021	.149	6.19	4.00	.645
	17	1.340	1.208	.132	.011	.143	6.07	3.87	.637
	18	1.400	1.220	.180	.013	.193	7.05	4.32	.613
	19	1.653	1.260	.393	.022	.415	10.33	6.31	.611
	20	.958	.620	.338	.042	.380	9.90	6.41	.647
Aver.	21	1.875	.960	.915	.043	.958	15.70	9.54	.607
	23	.805	.075	.730	.101	.831	14.62	9.17	.627
	Aver.								.645

0.5 BY 2 FOOT ORIFICE.

4	4	1.465	0.280	1.185	0.030	1.215	8.85	5.44	0.615
	5	2.150	.965	1.185	.016	1.201	8.80	5.40	.613
	6	2.595	1.682	.913	.009	.922	7.70	4.78	.620
	7	2.318	1.795	.523	.006	.529	5.83	3.62	.620
	8	1.868	1.310	.558	.010	.568	6.03	3.73	.619
	9	1.540	.960	.580	.013	.593	6.18	3.79	.613
	10	2.285	1.917	.368	.004	.372	4.90	2.92	.596
	11	2.045	1.945	.100	.002	.102	2.56	1.59	.621
	12	1.340	1.230	.110	.003	.113	2.70	1.60	.593
	13	.738	.625	.113	.007	.120	2.78	1.65	.594
	Aver.								.610

0.5 BY 1.5 FOOT ORIFICE.

6	6	2.110	1.700	0.410	0.008	0.418	3.90	2.48	0.637
	7	2.115	1.390	.725	.011	.736	5.17	3.30	.638
	12	1.210	.568	.612	.022	.634	4.80	3.05	.636
	13	1.225	.300	.925	.031	.956	5.89	3.66	.621
Aver.	14	.515	.090	.425	.047	.472	4.14	2.63	.636
	Aver.								.633

0.5 BY 1 FOOT ORIFICE.

7	2	1.081	0.977	0.104	0.004	0.108	1.32	0.82	0.621
	8	2.152	.715	1.437	.019	1.456	4.84	2.93	.605
	9	2.305	1.297	1.008	.012	1.020	4.05	2.50	.618
	10	.670	.477	.193	.015	.208	1.83	1.15	.628
	11	1.045	.390	.655	.027	.682	3.31	2.05	.619
	Aver.								.619

Recent Reclamation Orders.

CIRCULAR LETTERS.

No.

1155. Status of employees on furlough under the retirement act.
 1156. Reorganization of fiscal inspection districts.
 1157. Hotel rates.
 1158. Crop prices published in Reclamation Record.
 1159. Forms of application for permanent water right.
 1160. Post-card photograph of Reclamation Service structures.

No.

1161. Collection of delinquent accounts.
 1162. Consolidation of appropriation with project general accounts.
 1163. Procurement, distribution, and conservation of coal by the departments and establishments.
 1164. Repayment accounting.

RECLAMATION LAW NOTES.

By the Chief Counsel.

Obligations of Washington Irrigation Districts on Account of Bonded Indebtedness.

THE Supreme Court of the State of Washington in *State ex rel. Clancy et al. v. Columbia Irr. Dist. of Stevens County et al.* (208 P. 27) made the following holdings relative to the obligations of irrigation districts in that State in connection with bonded indebtedness, to wit:

Bonds issued by an irrigation district under Rem. Code 1915, sections 6430 to 6433, are general obligations of the whole district, as are those of an ordinary municipal corporation, the debts of which are incurred, and taxes levied to pay them, without considering the special benefit to the property affected, so that all the lands within the district are subject to taxation for payment of the entire obligation and not merely for their pro rata share, though section 6432 creates a specific lien on the property belonging to the district itself when the bonds are issued.

While a sale for general taxes forecloses the lien of an assessment for irrigation purposes, land owned by a county within an irrigation district, unless set aside as incapable of being benefited by the improvement, is subject to future assessments for payment of outstanding bonds, though acquired by tax foreclosure and after the organization of the district, in view of Rem. Code 1915, section 6432, providing that all land within the district shall remain liable for payment of its obligations until fully paid; the only provision for withdrawal of land from the district being by application to the board of directors and approval of their favorable action by a majority vote of the electors, under sections 6475 to 6479, if the obligation of the district's contracts are not thereby impaired (sec. 6475) and the bondholders expressly consent (sec. 6480).

Property sold to an irrigation district for unpaid assessments is liable to future assessments under Rem. Code 1915, sections 6416-6512, as against a contention that such action would be futile; the landowners being required to pay all assessments on redeeming, so that valuable rights could be lost to the district through a failure to assess and injustice occasioned owners who paid.

A contention that inclusion of lands sold to an irrigation district for unpaid assessments among those liable for future assessments will so apportion the amount to be raised as to produce an insufficient sum to pay outstanding bonds is without merit, the law requiring the taxing officers to levy a sufficient sum to produce the amount needed, in doing which they should add a sufficient sum to cover delinquencies of the previous year as expressly provided for by Rem. Code 1915, section 6437, as amended by Laws 1921, page 448.

Holders of irrigation district bonds need not resort to foreclosure of their statutory lien on the district's property before invoking the aid of the courts to compel assessments to pay their debts, such provision being only additional security of which the creditor is not required to avail himself.

Parol License for Irrigation Ditch in Colorado.

An easement in an irrigation ditch may be created by parol license. Where the owner of land gives a parol license to an adjoining property owner to construct an irrigation ditch across his land, the adjoining owner's right under the license depends on continued use. The adjoining owner can not enlarge the servitude or build the ditch in a different place. (*Finn v. Saffer* (Colo.), 208, p. 249.)

Appropriation of Water in Washington.

A settler acquiring title to public lands who first appropriates the water of a stream flowing across the land is entitled to the quantity of water appropriated, to the exclusion of those subsequently acquiring land higher up the stream and claiming under the doctrine of riparian rights. If the upper riparian rights had vested prior to appropriation by the lower owner upon the stream a different question would be presented. (*Leiser v. Brown* (Wash.), 208, p. 257.)

Abandonment of Water Right in Idaho.

The word "abandon" is held to mean "to desert or forsake." It is the relinquishment of a right by the owner thereof without any regard to future possession by himself or any other person, but with the intention to forsake or desert the right. As to whether or not a water right, the water itself, the ditch, canal, or other works have actually been abandoned or not depends upon the facts and circumstances surrounding each particular case, tending to prove the essential elements of abandonment, viz, the intent and the acts of the party charged with abandoning such right. Abandonment is most usually proved by evidence of the failure of the party charged to use the right to the water or to keep the works necessary for the utilization of the water in repair. (*Joyce et al. v. Murphy Land & Irrigation Co. et al.* (Ida.), 208, p. 241.)

Rights to Spring on Homestead Entry.

The water of a spring situate wholly upon a Government homestead entry is subject to appropriation for beneficial use, with the consent of the entryman. Such an entryman may, prior to patent, transfer by warranty against his own act, a right to the use of the waters of such a spring, with a right of way over said entry for carrying such water to the place of intended use. Such a grant is not in contravention of section 2290, United States Revised Statutes, which requires a homestead entry to be made for the purpose of actual settlement and cultivation, and not directly or indirectly for the use or benefit of other persons. (*Short v. Praisewater* (Ida.), 208, p. 844.)

Wyoming v. Colorado.

On October 9, 1922, upon defendants' petition for a rehearing in the case of Wyoming *versus* Colorado, the United States Supreme Court denied the petition, but made certain modifications in the decree of June 5, 1922, which do not affect the principles of law as originally laid down.

Electric Power on Salt River Project.

AN ACT authorizing the sale of surplus power developed under the Salt River reclamation project, Arizona. (Act Sept. 18, 1922, Pub. No. 309, 42 Stat. —.)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That whenever a development of power is necessary for the irrigation of lands under the Salt River reclamation project, Arizona, or an opportunity is afforded for the development of power under said project, the Secretary of the Interior is authorized, giving preference to municipal purposes, to enter into contracts for a period not exceeding fifty years for the sale of any surplus power so developed, and the money derived from such sales shall be placed to the credit of said project for disposal as provided in the contract between the United States of America and the Salt River Valley Water Users' Association, approved September 6, 1917: *Provided*, That no contract shall be made for the sale of such surplus power which will impair the efficiency of said project: *Provided, however*, That no such contract shall be made without the approval of the legally organized water users' association or irrigation district which has contracted with the United States to repay the cost of said project: *Provided further*, That the charge for power may be readjusted at the end of five, ten, or twenty year periods after the beginning of any contract for the sale of power in a manner to be described in the contract.

Irrigation Investigation in Nebraska.

JOINT RESOLUTION providing for an additional investigation of the tricounty irrigation project, Nebraska. (Resolution of Sept. 22, 1922, Pub. Res. No. 74, 42 Stat. —.)

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Interior, upon the payment to him in advance of the necessary funds to defray the expenses thereof, be, and he is hereby, authorized to make an additional investigation of the tricounty project in Nebraska, comprising the counties of Gosper, Phelps, and Kearney, in said State, and to extend said investigation into Adams County, Nebraska, with a view of ascertaining whether it is practicable to convey for irrigation purposes flood waters from the Platte River onto lands in said counties.

Bills Relating to Federal Irrigation.

IN THE HOUSE.

H. R. 12780.—"A bill granting extension of time for repayment of construction charges on the Uncompahgre reclamation project, Colorado," introduced September 21, 1922, by Representative Edward T. Taylor, of Colorado.

IN THE SENATE.

S. 4019.—"A bill providing for the transfer of reclamation projects to the water users under certain conditions, and for other purposes," introduced September 21, 1922, by Senator William H. King, of Utah.

—Ottomar Hamel.

DEVELOPMENT OF SMALL-FRUIT WAREHOUSES ON YAKIMA PROJECT.

AS AN illustration of the ambition and initiative of Yakima project farmers in the development of the fruit business, the notable achievement of E. Chénaur & Sons, water users and orchardists of the Sunnyside Division, is cited.

Mr. E. Chénaur is a native of France. When 17 years of age he came to the United States, settling at Mount Pleasant, Iowa, where he lived for 7 years, moving from there to Nebraska, where he made his home for 22 years. In 1898 he moved his family to the Yakima Valley and bought a 40-acre farm 3 miles east of Zillah, in the Orchardvale district. The entire 40 acres were planted to fruit trees, and during the period of waiting for the trees to come into bearing the family living was obtained by growing potatoes, watermelon, and canteloupe between the tree rows. There were several sons old enough to assist materially in caring for these crops, and good returns were secured.

In 1907 Mr. Chénaur and three married sons, John, Julius, and Charles, formed a partnership and purchased 124 acres of fine orchard land lying at the southeast corner of the town of Zillah, which they have planted to apples, pears, peaches, prunes, grapes, and hay. The land is irrigated from two laterals of the Sunnyside Canal system. This venture has been a decided success, and each of the four partners now has a fine, modern residence on the land. Their annual fruit crop amounts to about 30,000 boxes. They also have a warehouse 60 by 150 feet, equipped with every convenience for sorting, packing, and storing fruit. It is located on both the Northern Pacific and Oregon-Washington Railroad, which greatly facilitates the loading and shipping of fruit and hay. About 32 people are employed in the warehouse for a period of 90 days during the fruit season, sorting, sizing, and packing. In addition to handling their own products, Chénaur & Sons do a general fruit commission business. This year they bought about 50,000 boxes of apples, which they are shipping to all parts of the world.

The business conducted by the present partnership of E. Chénaur & Sons is very likely to be continued under the same name for several generations to come, as all the sons have growing families of sturdy boys and girls.

There are a great many fruit-packing houses of this size on the Yakima project, where the crop is taken care of in a modern, up-to-date way, and carefully put up in honest, attractive packages for the market.

The principal crops grown in 1920 on the Milk River project were alfalfa, small grains, and native blue-joint hay. Native blue-joint hay comprised about 60 per cent of the total cropped area.

ADMINISTRATIVE AND STATISTICAL PROGRESS REPORTS FOR SEPTEMBER, 1922.

Monthly conditions of principal Reclamation Service reservoirs for September, 1922.

[Elevation above sea level.]

State and project.	Reservoir.	Available capacity in acre-feet.	Elevation.		Storage in acre-feet.			Out-flow in acre-feet.	Elevation of water surface.		
			Spill-way crest. ¹	Lowest gate sill. ²	Beginning of month.	End of month.	Maximum.		Beginning of month.	End of month.	Maximum.
Arizona, Salt River.....	Roosevelt ³	1,305,000	2128.1	1924.6	675,168	566,737	675,168	.....	2101.46	2091.65	2101.46
California, Orland.....	East Park.....	51,000	1199.68	1111.68	14,890	2,770	14,890	11,740	1173.4	1149.21	1173.4
Idaho:											
Boise.....	Arrowrock.....	280,000	3211	2956	51,030	.....	51,030	91,000	3097.3	2956	3097.3
	Deer Flat.....	177,000	2518	2488	23,098	11,500	23,098	20,000	2495.6	2492.6	2495.6
Minidoka.....	Lake Wolcott.....	95,180	4245	4236	104,460	51,060	104,460	219,790	4245.77	4241.05	4245.77
	Jackson Lake.....	847,000	6769	6728	245,520	255,650	255,650	25,544	6743.13	6743.62	6743.62
Montana:											
Milk River.....	Nelson.....	38,500	2216	2200	25,800	29,000	29,000	250	2212	2213.28	2213.28
St. Mary storage.....	Sherburne.....	66,000	4788	4720	9,690	.....	9,690	9,690	4741	.....	4741
Sun River.....	Willow Creek.....	16,700	4130	4085	11,922	11,922	11,922	.....	4125	.....	4125
Nebraska-Wyoming, North Platte.	Pathfinder.....	1,070,000	5852	5670	464,870	304,020	464,870	163,252	5814.79	5797.87	5814.79
	Lake Alice.....	11,400	4182	4159	528	4,018	4,018	.....	4161.2	4170.4	4170.4
	Lake Minatare.....	60,760	4125	4074	10,989	7,750	10,989	.....	4093.2	4089.3	4093.2
Nevada, Newlands.....	Lake Tahoe.....	120,000	6230	6224	.....	.....	.....	728,612	6226.48	6225.99	6226.48
	Lahontan.....	273,600	4162	4060	199,850	163,720	199,850	43,488	4153.5	4148.2	4153.5
New Mexico:											
Carlsbad.....	McMillan.....	45,000	3267.7	3241.6	.....	.....	.....	1,500	3253.6	3250.6	3253.6
Rio Grande.....	Elephant Butte.	2,638,000	4407	4231.5	1,719,204	1,627,804	1,719,204	118,578	4380.8	4377.7	4380.8
Oregon, Umatilla.....	Cold Springs.....	50,000	621.5	560	11,475	1,875	11,475	8,820	586.94	568.35	586.94
Oregon-California, Klamath.	Clear Lake.....	462,000	4540	4514	384,000	373,000	384,000	100	4537	4536.6	4537
South Dakota, Belle Fourche	Belle Fourche.....	203,000	2975	2920	87,500	68,300	87,500	22,431	2957.4	2953.1	2957.4
Utah, Strawberry Valley....	Strawberry.....	250,000	7558	7517	222,600	210,500	250,000	12,100	7554.2	7552.5	7558
Washington:											
Okanogan.....	Conconully.....	14,400	2290	2232	2,060	1,450	2,060	1,276	2255	2251	2255
Yakima.....	Bumping Lake..	34,000	3426	3389	15,555	2,314	15,555	13,241	3409.9	3392.6	3409.9
	Lake Cle Elum..	20,800	2134	2122	7,720	6,038	7,720	1,682	2126.4	2125.6	2126.4
	Lake Kachess... ⁴	210,000	2258	2192	104,408	40,710	104,408	63,698	2228.8	2107.4	2228.8
	Lake Keechelus..	152,000	2515	2425	18,241	5,592	18,241	12,649	2439.3	2429.4	2439.3
Wyoming, Shoshone.....	Shoshone.....	456,600	5360	5132.3	428,481	360,993	428,481	102,329	5355.7	5344.5	5355.7

¹ Or maximum storage.² Or zero storage.³ Zero water depth at elevation 1902.2.⁴ Amount of silt shown by silt survey deducted from original capacity.⁵ Proposed regulation.⁶ Estimated low-water limit under proposed plan of regulation.⁷ Draft for power purposes.⁸ Elevation of reservoir raised 12 inches by stop logs in spillway.

SALT RIVER PROJECT, ARIZONA.

Water was run in all of the canals during September. The demand for irrigation water service was unusually heavy for this season of the year.

Five regular crews were in the field.

With a daily average of 166 man days and 33 stock days the following maintenance work was accomplished: 33 miles main canal demossed; 122 miles main canal cleaned and mowed; 211 miles laterals cleaned and mowed; 81 old structures repaired; 3,208 linear feet riprap placed; 2,451 cubic yards earth moved.

In addition the Ruth dredger with a daily average of 4 men and 6 head of stock bermed 31,200 linear feet of main canals, moving approximately 5,000 cubic yards of earth from banks of Arizona Canal.

The P. & H. (one-half yard) drag line moved approximately 4,000 cubic yards of earth in the enlargement of Chandler drain, and approximately 1,400 cubic yards in the enlargement of irrigation ditches. This machine used two men daily.

With the daily average of 57 man days and 20 stock days the following construction work was accomplished: 2 miles new waste ditch dug; 89 new structures installed; 4,815 cubic yards earth excavated; 101 cubic yards concrete placed; 1,248 linear feet concrete pipe placed.

With a daily average of 7½ man days and 2 stock days work continued on widening Eastern Canal. The

Monighan (2 yards) drag line moved 5,750 cubic yards of material. The Lidgerwood (1½ yards) drag line moved 7,670 cubic yards of material.

In addition test holes were put down to determine ground conditions between Eastern and Consolidated Canals.

Operation of power system.—Total generated during month, 8,812,920 kilowatt hours; maximum output for one day, 329,750 kilowatt hours; maximum load, 14,200 kilowatts; maximum daily average load, 13,740 kilowatts; average daily load for month, 12,240 kilowatts; highest daily load factor, 100 per cent; lowest daily load factor, 68.4 per cent; monthly load factor, 84.2 per cent.

The voltage taps on the Glendale transformers were changed to the 11,500 volt connections to give higher voltage in Glendale.

On September 27 the air receiver on the Highline pumping plant pipe line became loosened and leak developed. The plant was shut down and the opening in the pipe line plugged with steel plates inside and outside of pipe bolted together and intervening space filled with sulphur. The plant was shut down about 25 hours.

The installation of the Bennett surge arresters on the 2,300-volt leads at Roosevelt was completed as far as possible with the material available.

The installation of the Worthington axial flow pump at 23 E. 4½ S. was completed soon after the first of the month and put in operation.—C. C. Cragin.

YUMA PROJECT, ARIZONA-CALIFORNIA.

Alfalfa seed harvest was practically completed with an average yield below normal; price remained about 13 cents. Cotton prospects were not so favorable as earlier in the season. On September 2 a cloud-burst on the desert above the main canal caused two large breaks which were repaired by the 12th; no damage to crops on account of the break was reported.

Work was begun on a fireproof vault for Yuma headquarters.

The demand for water was heavy during the latter part of the month; 12,300 acre-feet were delivered. The deliveries to the end of September amounted to 116,700 acre-feet, 9,000 acre-feet less than for the same period in 1921. The 30-B Bucyrus continued work cleaning the main drain, completing 1.3 miles. All Ruth dredges were laid up for overhauling. The maximum discharge of the Colorado River was 16,700 second-feet; minimum, 4,500 second-feet; total for the month, 524,400 acre-feet. On September 30 the gauge was 15.5 feet, with a discharge of 4,700 second-feet.

Mesa division.—A small force was employed at the Mesa pipe-manufacturing plant making changes necessary for the manufacture of lock-joint pipe in 8-foot sections. The 16-inch Krogh pump was operated 68 hours, delivering 104 acre-feet of water. One survey party was employed locating center line and setting cross-section stakes for new construction work.—*Porter J. Preston.*

ORLAND PROJECT, CALIFORNIA.

High temperatures occurred for a period of 10 days in September, which was preceded and followed by pleasant weather. The maximum of 109°, occurring on the 10th, was one of the highest September temperatures ever recorded at Orland.

Three carloads of almonds, mainly products from project trees, were shipped, making a total to the end of the month of 4 carloads. The harvesting of the fourth crop of alfalfa was completed during the early portion of the month and a large part of the fifth and last crop was well matured at its close. The gathering of the prune crop was not altogether completed owing to the lateness of the season.

Three men were engaged in regular maintenance work on the distribution system and a force of three teams and four men began cleaning and repairing the East Park feed canal. The unusually high temperatures created a large demand for irrigation water, with the result that water deliveries were greater than the normal for September.

The Sixth Annual Glenn County Fair was held at Orland during the week of September 18 to 23, inclusive. Live-stock exhibits, limited by the accommodations available, were the largest in the history of the fair. Westside and Lake Farm centers, located in the Orland project, were awarded first and second prizes, respectively, for farm center agricultural exhibits.—*R. C. E. Weber.*

GRAND VALLEY PROJECT, COLORADO.

September weather was slightly warmer than normal, with a deficiency of precipitation. Conditions were favorable for the maturing and harvesting of crops and for outdoor work of all kinds.

The Elberta peach harvest in the Palisade district ended early in the month, when the supply of refrigerator cars was practically exhausted after about 1,000 cars had been shipped. The harvesting of pears

and apples continued. Most of the potatoes on the project were shipped at prices averaging 60 cents per hundredweight. The third cutting of alfalfa had been stacked, producing a good yield of excellent quality. The prices of all products were low with the exception of alfalfa, which was quoted at about \$9 per ton in the stack.

The irrigation system delivered about 8,000 acre-feet of water to the project and the irrigation districts. Maintenance consisted of routine work and the repair of Asbury Creek and Badger Wash bridges, damaged by floods in August. Drainage construction was continued with two dragline excavators, which completed 3,200 feet of drain, involving 15,000 cubic yards of excavation.

Final settlement of the indebtedness of the Orchard Mesa Irrigation District was completed on September 8 by delivery to the directors of the \$100,000 advanced by the United States, which, together with \$60,000 subscribed by the landowners, was exchanged for outstanding bonds and warrants with a face value of over \$2,000,000. A construction force was organized early in the month to begin work preliminary to the construction of the siphon to carry the Orchard Mesa Canal under the Colorado River. The old buildings at camp 4 were repaired; lumber, supplies, and equipment were assembled; and preparations completed to begin construction at an early date.

The project manager spent several days in the Denver office on matters connected with the Orchard Mesa work and also visited the Strawberry and King Hill projects to inspect equipment available for transfer.—*S. O. Harper.*

UNCOMPAHGRE PROJECT, COLORADO.

The dry weather which has prevailed since the spring, with the exception of August, continued during September.

The uncollected water rentals due from the season 1921 on September 30 amounted to approximately \$3,813. The total cash collections to September 30 on account of water rentals for the season 1922 amounted to approximately \$57,211. The demand for irrigation water gradually decreased throughout the month.

A few men were employed off and on during the month in draining the sliding-bank section of the Ironstone Canal west of Olathe. Work was begun on the repairs to the washed-out tunnel road over Vernal Mesa to River Portal.

The P. & H. dragline began work on the excavation and enlargement of the Loutsenhizer Canal between the headworks and the North Mesa Lateral headgate on the 7th.—*L. J. Foster.*

BOISE PROJECT, IDAHO.

During September the weather was extremely warm until the 27th, when the first killing frost of the season occurred. There was only a trace of precipitation during the month.

Harvest was under way for prunes, apples, clover seed, and the third cutting of alfalfa. A few potatoes were shipped, but the price offered would hardly justify the cost of digging. The head-lettuce crop was seriously damaged by protracted hot weather, which caused all of the early planting to go to seed. Alfalfa hay was in good demand at \$7 and \$8 per ton in the stack. A large number of cattle and sheep were brought in from the ranges for fall pasture.

The mean discharge of the Boise River during the month was about 750 second-feet, which was slightly

below normal. Owing to the hot, dry weather, there was a heavy demand for irrigation water during the first part of the month.

Water-logged areas were surveyed on the Arrow-rock Division to determine the temporary suspensions to be made.—*J. B. Bond.*

KING HILL PROJECT, IDAHO.

September was warm and dry, being favorable for construction work and the harvesting of crops.

Three small construction camps were erected, and with an average force of about 60 men began September 18 backfilling 6,147 linear feet of the Main Canal preparatory to lining with reinforced concrete; 9,000 cubic yards of puddled backfill were placed. A small force was engaged on the construction of surface drains for the protection of Head End flume. Screening and washing gravel for lockjoint pipe was completed. Four thousand three hundred linear feet of lateral 4 were enlarged by the P. & H. 206 drag line in 22 shifts, 2,287 cubic yards of material being moved. The Slick Bridge repairs were completed by the United States Bridge Co. on September 8. Two hundred and twenty-five cubic yards of gravel were delivered at the site of Camas Road Canal lining by contractors.

Bids were opened September 21 for canal enlargement on Main Canal and Main Canal extension. Bids were received on 47 of the 63 schedules.

Water deliveries were discontinued September 17, after which date a small head was maintained in the system for use by construction forces in puddling backfill.

Three field parties were engaged on topographic survey of Bennett Creek Reservoir, structure and lateral location, and cross-sectioning Main Canal for enlargement and lining.—*A. M. Rawn.*

MINIDOKA PROJECT, IDAHO.

September was notable for the hot, dry weather that prevailed during almost the whole time.

Owing to weather conditions, there was a heavy demand for water throughout the month. At the first lift, 32,136 acre-feet were pumped, which exceeds the record for any other September. Snake River fell so low that on the 21st it was necessary to open the gates at Jackson Lake, which had been entirely closed on the 10th, and let out the normal flow from the reservoir. The Minidoka and Twin Falls projects were supplied mainly from Lake Walcott.

All farm operations made good progress. The third cutting of hay was practically completed, most of the wheat was thrashed, and potato harvest was begun. Prices for hay and grain were fair. Potatoes were shipped on a poor market.

The power house and pumping station were operated practically without interruption, the power house being off line for one minute on the 11th.

On the 11th a temporary injunction was issued by the district court restraining the commissioners of Twin Falls County from calling an election to vote on the proposed American Falls Reservoir District. October 6 was set as the date for hearing the case.

One survey party was engaged in a revision of the canal location from Island Park Reservoir to the DuBois project.—*Barry Dibble.*

HUNTLEY PROJECT, MONTANA.

September was warm and dry, which was conducive to a maximum growth of sugar beets. No frost oc-

curred until the 28th; thus the project had a growing season of 145 days free of frost this year.

Delivery of water was continued throughout the month; the demand, however, was light. Practically all maintenance work was suspended temporarily with the exception of the operation of the Ruth machine, which was cleaning ditches during the entire month. Supplemental construction work was limited to replacement of a few small structures, turnouts, and checks. All of the major wooden structures on the Pryor division have been replaced.—*A. R. McGinness.*

MILK RIVER PROJECT, MONTANA.

September temperature was about 4 degrees above the average, with precipitation somewhat below the average. Except for being too dry for plowing, weather conditions were good for farming, construction, and maintenance operations; however, labor shortage seriously interfered with progress. Threshing was about completed and potato digging in full swing. A board of review, consisting of C. M. Nye, assistant chief engineer of the Great Northern Railway; Carl S. Scofield, of the Department of Agriculture; and E. E. Jones, of the United States Geological Survey, convened at Malta on September 26.

Construction by Government forces was confined to working two drag lines, one on Glasgow Division waste-water ditches and the other on drainage near Dodson. Construction by contract on Nelson Reservoir enlargement and lateral extensions progressed only slowly owing to shortage of labor.

The Dodson South Canal was operated the entire month for delivery of water to Nelson Reservoir, and other canals on the Malta Division were operated occasionally for service to a few water users. On the Chinook Division only the Fort Belknap Canal was operated. Gates at Vandalia Dam were painted, and the Ruth dredger was operated 40 shifts, cleaning 10 miles of laterals on the Glasgow Division.—*Geo. E. Stratton.*

ST. MARY STORAGE.

During September the temperature was considerable above normal and conditions were particularly favorable for work being carried on, there being very few stormy or severely windy days.

At Sherburne Lakes Reservoir there were 9,690 acre-feet of water in storage at the beginning of the month, which was all released during the month. About 2,500 acre-feet were diverted to St. Mary Canal.

The St. Mary Canal was operated to approximately one-half capacity during the entire month; 15,040 acre-feet were diverted from St. Mary River and 11,807 acre-feet were delivered to North Fork of the Milk River.

Construction work was confined to rebuilding 1,450 linear feet of porous canal bank on the seventh mile.—*R. M. Snell.*

SUN RIVER PROJECT, MONTANA.

The earthwork contractors on part 2 of the Greenfields division made good progress, notwithstanding a shortage of laborers. The contractor on structures has been falling behind, and even with favorable weather extending well into November there will be a big job left for next spring in order to finish all of the work by the middle of June.

The drag-line excavator worked two shifts per day throughout the month and dug 8,760 linear feet of open drain A, moving 16,680 cubic yards of material.

Very little water was delivered on either the Fort Shaw or Greenfields division, and it was planned to close the operating season early in October. The regular operating force was engaged on repairs to structures and the concrete lining at mile 3, Greenfields Main Canal. The weather was ideal for harvesting, and the farmers were about half through this work. It was evident that a large portion of the wheat was being stored on the farm. There were no frosts in September, which is quite unusual.

Shipments from the project consisted of 2 cars of hay and 11 cars of wheat.—Geo. O. Sanford.

Prevailing crop prices at close of September, 1922.

Project.	Alfalfa hay, per ton.		Barley, per bushel.	Oats, per bushel.	Wheat, per bushel.	Potatoes, per bushel.
	In stack.	Baled at shipping point.				
Salt River.....	\$3.00	\$12.00	\$0.80	\$0.55	\$1.20	
Yuma.....	13.00	17.00				
Orland.....	9.50	15.00	.55		.99	
Grand Valley.....	9.00	12.00		.50	.80	\$0.35
Uncompahgre.....	8-10		.50	.33	.80	.30
Boise.....	7.50	11.00	.55	.40	.75	.25
King Hill.....	8.00					.40
Minidoka.....	7.00	9.00	.45	.30	.72	.24
Huntley.....						
Milk River.....	8.00	12.00	.36	.32	.85	.60
Sun River.....	10.00	15.00	.50	.50	.82	.50
Lower Yellowstone.....	5-7	9.00	.35	.21	.86	.45
North Platte.....	8.00					.30
Newlands.....	8.50	12.50	.62		1.00	1.60
Carsbad.....		18.00				
Rio Grande.....		15-20		.65	1.15	
North Dakota pumping.....	10.00			.18	1.06	.30
Umatilla.....	12.00	16.00				
Klamath.....	8-10		.60	.40	.90	
Belle Fourche.....	5.00	9.00	.38	.24	.85	.45
Strawberry Valley.....	8.00	11.00	.70	.50	.75	1.40
Okanogan.....						1.80
Yakima.....		13.50				.45
Shoshone.....		9.50			.80	1.42
Indian projects:						
Blackfoot.....	12.00		.80	.35	.53	1.20
Flathead.....		15.00			.70	.30
Fort Peck.....	10.00		.16		.86	.50

¹ New.

LOWER YELLOWSTONE PROJECT, MONTANA-NORTH DAKOTA.

The total precipitation for September was 2.47 inches, which is the largest precipitation on record for September, other than in 1911 when there was 3.82 inches. The average since 1906 is 1.22. This precipitation fell during the first two weeks of the month and greatly retarded the harvesting and delayed the contractors a few days.

Under contract 878 contractors Beauchaine & Klug made good progress, considering the shortage of laborers. Should they be able to continue during the month of October at the same rate of progress as during September they will complete their contract on time. They have experienced considerable trouble in securing teams for back filling of structures, but it was expected that by the middle of October, when harvesting will be nearly completed, teamsters with teams will be plentiful. Contractor Gene Hoffstot, under contract 883, has completed schedules 1, 2, and 3, and at the end of the month had practically completed

the work of removing slides in the main canal recently constructed by Contractor Hilton.

Owing to the small amount of water deliveries it was possible to use two of the ditch riders from the 12th to the end of the month in operating drag line No. 1 at Arkle Point. During this time 3,600 cubic yards of sliding material were moved at this place, and only one day's work remained to complete placing the canal section not only up to its normal condition, but from 5 to 10 feet wider, in order to permit some sliding before any material is in the canal prism.

Two men were engaged the greater part of the month in cutting weeds in laterals and leveling the lateral banks where material was placed by the Ruth machine in 1921. The operation and maintenance organization on both districts Nos. 1 and 2, other than the ditch riders, consisted of only two laborers. Fortunately, little irrigation was carried on and the ditch riders were used to good advantage on maintenance work.

On District No. 2 the Ruth dredger completed cleaning the lateral D system, all of the E system other than laterals E-1 and F-2. This machine traveled 27,400 linear feet and moved 4,870 cubic yards of material. Not so good progress was made with this machine as heretofore, as the laterals were small and the top width of the banks in many cases did not exceed 1 foot. It was difficult to keep the machine on the banks, and in some instances half days were lost without moving any materials owing to the machine sliding off the banks.

All the lateral extensions from headworks to Sidney have been primed, and about 5 miles of the lateral extensions in the vicinity of Fairview have been primed in readiness for next year's operation.—L. H. Mitchell.

NORTH PLATTE PROJECT, NEBRASKA-WYOMING.

The continued drought and hot weather during September brought about the heaviest demand for irrigation experienced during this month in the history of the project. The September diversion from the river exceeded any previous record by at least 30 per cent. Delivery of water to the farmers ceased September 30 and the Main Canal was being operated to fill Lake Alice and Lake Minatare to something like two-thirds capacity. During November the building of the Sand Point culvert, which was lost by the canal break in June, 1921, will be begun and its completion and backfill assured before the beginning of the next irrigation season.

On the Interstate Division the building of the Spottedtail Flood Water Channel near Mitchell continued and will be completed during October. Replacement of decayed wooden structures on the Third Lateral District was being continued with a small force of about seven men.

Two class 9½ Bucyrus excavators continued on the Main Canal, working downstream about 7 miles south of Mitchell. The building of the Katzer Drain continued. The Horse Creek lateral system was being pushed forward and will be completed by the beginning of irrigation, 1923.

The class 14 Bucyrus excavator worked continuously on the Indian Creek Outlet Channel and will complete the same during October. The building of lateral and main canal structure was being continued with a force of about 40 men.

Three Ruth cleaners were at work on the first, second, and third lateral districts and cleaned a total of 19.1 miles and excavated approximately 12,850 cubic yards. One of these machines was used for building a road grade nearly one-half mile in length

with excellent results. This was done under cooperative agreement between the United States and Sioux County, Nebr.

The beet crop is the best of any season on record. Corn crop is excellent. Third cutting of alfalfa the best we have seen. Potatoes are good in some fields, poor in others. Generally speaking, the crop conditions are good.

Contracts for flowage rights in the Guernsey Reservoir basin, aggregating a total of \$95,600, were consummated and forwarded for approval.—*Andrew Weiss.*

NEWLANDS PROJECT, NEVADA.

September weather was favorable for crops and all outside work. Light frosts near the end of the month did no material damage.

The Lahontan power plant was operated practically the entire month from the reservoir, supplemented by a flow of 20 second feet from the Truckee Canal.

Maintenance forces repaired 15 timber structures and removed willows, weeds, etc., from about 8 miles of laterals, largely in the V system, Carson Division. An average force of about 12 men was employed on this work. Eight head of Government stock supplemented by a few teams for short periods were used.

Aside from drainage only a small amount of construction work was in progress. This consisted of the completion of the Dalby Lateral and the installation of seven minor timber structures.

Average progress was made on drainage construction, in which connection six drag-line excavators were in operation. One Austin drag line was employed on drain cleaning work. Approximately 210,000 cubic yards of material were removed on drainage excavation. Numerous timber culverts and waste-ways were installed in the new drains.

The cantaloupe harvest was completed before the end of the month. A total of about 50,000 crates of "Hearts of Gold" cantaloupes were shipped during the season, largely to eastern markets. Excellent yields from the area planted to these melons were reported, in some cases being about 500 crates per acre.

Losses from stock in Carson Lake pasture, as the result of an epidemic of anthrax, were greatly diminished, indicating that the vaccination on August 15 was effective.—*John F. Richardson.*

CARLSBAD PROJECT, NEW MEXICO.

September weather was generally fair and favorable for the maturing of the cotton crop. There were 2.14 inches of rainfall which was extremely beneficial to parts of the range and for the cotton crop, which in some localities was suffering from lack of moisture owing to shortage of storage water.

Water was in the canal continuously. Deliveries were limited to the flow of the river between Lakes McMillan and Avalon, which averaged about 150 acre-feet. The maintenance force was employed during the latter half of the month cleaning drains and making minor repairs in the lateral system.

The general condition of the cotton crop was somewhat improved, owing to more even temperatures and the rainfall. Cotton picking started about the 10th; the Tipton gin also started operation about that date. The Carlsbad, Otis, Loving, and Malaga gins started operations on the 15th. At the close of the month approximately 500 bales were ginned. The cotton was of excellent grade and was selling at prices rang-

ing from 22 to 26½ cents per pound. Good alfalfa hay was bringing \$18 per ton, and alfalfa seed sold on the project for an average price of about 11½ cents per pound. The fourth cutting of alfalfa was being harvested. The crop generally was rather short, owing to lack of irrigation water. Slight improvement, due to light rains, was reported in the surrounding range country.—*L. E. Foster.*

RIO GRANDE PROJECT, NEW MEXICO-TEXAS.

Construction work continued on drains and laterals in the Leasburg-Mesilla Division with the operation of eight excavating machines a total of 11 shifts. Neither of the three drag-line excavators working primarily on drains operated continuously on this feature throughout the month, the Monighan 2-T being held up on account of major structure work; the Bucyrus 9½, working on the Picacho Drain, worked on lateral construction part of the month; and the Bucyrus 9½, moving to the Montoya Drain, did not begin excavation until the 22d. A total of 49,739 cubic yards was removed from 1.03 miles of drain. The third Bucyrus 9½ completed the Anthony lateral, while the two P. & H. 206 excavators continued on combined river laterals and levees, one in the Picacho area and one on the Del Rio. Two Ruth ditching machines continued on lateral reconstruction. 57,403 cubic yards were placed in 4.8 miles of lateral and levee by the drag-line machines, and 17,337 cubic yards were removed from 7.2 miles of old laterals by Ruth machines.

In the El Paso Division construction work on drains and laterals progressed with the operation of four machines operating a total of five shifts, and the P. & H. 206 excavator was employed one shift on drain cleaning. A total of 79,095 cubic yards was removed from 1.7 miles of drain, and the Ruth ditching machine finished the reconstruction of the Clint lateral and moved to the island district. It excavated 3,500 cubic yards from 3.05 miles of lateral, and the P. & H. drag line cleaned 2.6 of the Mesa Drain, removing 11,500 cubic yards.

As during the month of August and the last half of July, there was still an absence of inflow into the Elephant Butte Reservoir. Water was delivered for irrigation throughout the month on all four divisions, decrease in storage being 91,330 acre-feet. The condition of canals and laterals was in general much better than in any previous year, and winter maintenance work, especially canal cleaning, will be much less than heretofore. This is accounted for by better sluicing facilities and the fact that there is less sand in the river because of the absence of the usual summer floods.

Shipments of cantaloupes and pears were completed early in the month. The fourth cutting of alfalfa was under way and the picking and ginning of cotton had begun. There was prospect of a bumper crop of cotton of better than average grade and considerably above the average yield.

Dr. Idelfonso Albano, of Brazil, where he is Prefeito of Fortaleza, Ceara, accompanied by his wife, visited Elephant Butte Dam and the other points on the Rio Grande project.

Photographic display showing the works of the Reclamation Service and the crops produced on the Rio Grande project, appropriately titled, was placed in a show window of one of the principal business houses of El Paso in connection with the sale of the recently issued project map. This display was taken

to the State fair at Dallas, Tex., as a part of the El Paso County exhibit.

During the year ending August 31, 1922, the Mesilla Valley Poultry Association shipped 1,086,483 eggs, amounting to \$29,900.94.—*L. M. Lawson.*

NORTH DAKOTA PUMPING PROJECT.

Half of September was very wet and all farm work was set back, but this was fairly well caught up by the end of the month, as the latter half of the month saw splendid weather.

The crops were above average and more diverse than heretofore. There were unusual yields of corn and potatoes.

The transmission line was tested out for defective poles and connections. Several 40-foot poles were replaced and defective cross arms and insulators renewed.

The usual power-plant operations were conducted in connection with the commercial power contract; 88,100 kilowatt-hours of electrical energy were delivered to Williston, or about 2,000 kilowatt-hours less than during August.

At the close of the irrigation season the rooms in the coal mine were exhausted, so entries were partially driven in September to admit of turning off new rooms. Practically all coal was entry coal, but by the end of the month some rooms were ready again. About 1,000 tons were mined.—*Wm. S. Arthur.*

UMATILLA PROJECT, OREGON.

Ideal weather conditions for farming operations prevailed throughout September. Absence of frost allowed late crops to mature.

The East Division virtually closed the irrigation season at midnight on the 30th, when water in the main distributary canal was reduced to a flow of 20 second-feet, which will be enough for lands undergoing new seeding of alfalfa. The Hermiston Drain discharged into the Umatilla River at end of the month 60 second-feet.

Irrigation was light during the month. The harvesting of the third crop of alfalfa was completed. Baling and hauling alfalfa, picking and packing of apples, and digging of potatoes were engaged in during the month.

At the beginning of the month the ditch-rider force on the East Division was reduced, and at the end of the month the balance of the force was transferred to construction work. The force on the West Division was maintained throughout the month. The usual work in connection with the maintenance of canals and structures was carried on by two small crews.

East Division.—Delivery of materials for the A line improvement was under way and 3,200 cubic yards of material were excavated. Due to the shortage of labor, no concrete was placed. On supplemental construction 192 linear feet of 20-inch and 1,430 linear feet of 16-inch concrete pipe were laid; 1,982 linear feet of 20-inch and 3,262 linear feet of 16-inch concrete pipe were manufactured.

West Division.—Delivery of concrete pipe for the construction of two laterals was commenced.

C. P. Adams, a project settler, received first and place awards on his exhibit of Duroc hogs at the State fair. Preparations were being made for the Annual Hermiston Hog and Dairy Show, which takes place on October 6 and 7.

At the end of the month Mr. Caukins, of the United States Geological Survey, was making a study of the

formations at the proposed McKay Reservoir site.—*H. M. Schilling.*

KLAMATH PROJECT, OREGON-CALIFORNIA.

During September the demand for water fell off rapidly. Water was turned out of the Main Canal for the season on September 30. The farmers completed the second cutting of alfalfa hay. Practically all of the project grain crop was cut and threshing was well under way. On the Tule Lake leased lands the major portion of the grain crop was harvested; on these lands combination harvesters were being used.

In the Tule Lake Division four drag-line excavators were engaged in constructing the canal and lateral system. Contracts had been let for building the turnouts, checks, and other structures.

In the Langell Valley Division good progress was being made in constructing the diversion dam on Lost River. Contracts had been awarded for the construction of the lower end of the West Side Canal. The upper end of the canal will be constructed by Government forces, all bids having been rejected. Two parties were engaged in making a topographic survey of Langell Valley.

The first part of the Tule Lake Division, consisting of about 10,000 acres, will be opened to homestead entry on October 27.

On September 30 Mr. E. Newman, engineer for the San Joaquin Light & Power Corporation, of Fresno, Calif., arrived on the project, having made a special trip to inspect the precast concrete flume on the C Canal.—*H. D. Newell.*

BELLE FOURCHE PROJECT, SOUTH DAKOTA.

The hot, dry weather of August continued throughout September and at the close of the month no killing frost had occurred. The warm, open weather was most favorable to harvesting and threshing operations and good progress was made.

The demand for irrigation water was continuous although not heavy during the month. The irrigation season ended with the 30th, and the reservoir gates were closed on that date.

Repair of the break in the pavement of the Belle Fourche Dam was completed and the entire pavement given careful inspection.

The Baby Ruth dredger worked the full month except for time lost in making repairs.

Word was received near the close of the month that the proposed contract between the United States and the Belle Fourche irrigation district (yet to be formed) had been approved by the Secretary of the Interior.—*B. E. Hayden.*

STRAWBERRY VALLEY PROJECT, UTAH.

September weather was clear and warm with practically no precipitation. Conditions were favorable for the maturing and harvesting of crops. The third cutting of alfalfa was harvested, with good yields reported. Sugar beets improved during the month. The estimated tonnage was below the 10-year average, however. Digging will begin about October 9. Most of the peach crop was picked and shipped by the 20th. Car shortage prevented the marketing of the entire crop. Crops generally were in good condition and yields will be above the average. Prices, however, were unsatisfactory from the standpoint of the farmers.

Demand for irrigation water was heavy and 21,272 acre-feet were delivered to the head gates of the several project canals; of this amount 13,000 acre-feet were derived from Strawberry Reservoir. Total water deliveries to the High Line Division amounted to 5,784 acre-feet; to the Spanish Fork Division, 13,648 acre-feet; and to the Springville-Mapleton Division, 1,840 acre-feet.

Embankments of Trail Hollow Feeder Canal were repaired and water turned out of Indian Creek Canal on the 11th for removing moss and willows.

The project power plant was in continuous operation, delivering 95,949 kilowatt-hours to the several project towns.—*W. L. Whittemore.*

Summary of employees for September, 1922.

Projects and offices.	Begin- ning of month.	End of month.	In- crease.	De- crease.
Washington office.....	77	77		
Denver office.....	59	56		3
Field legal ¹	18	17		1
Examiners of accounts.....	2	2		
Yuma.....	126	127	1	
Yuma auxiliary.....	11	33	22	
Orland.....	24	27	3	
Grand Valley.....	38	54	16	
Uncompahgre.....	62	59		3
Boise.....	128	103		25
King Hill ²	72	72		
Minidoka.....	99	88		11
Huntley.....	27	13		14
Lower Yellowstone ³	25	25		
Milk River.....	59	56		3
St. Mary storage (includes half time of 6-5 on Blackfeet).....	17	18	1	
Sun River.....	40	45	5	
North Platte.....	394	351		43
Newlands.....	132	122		20
Carlsbad.....	12	13	1	
Rio Grande.....	390	360		30
North Dakota pumping.....	40	32		8
Klamath ²	130	130		
Baker.....	37	41	4	
Umatilla.....	45	65	20	
Belle Fourche.....	39	36		3
Strawberry Valley.....	19	19		
Okanogan.....	34	12		22
Yakima.....	120	132	12	
Tieton Dam.....	474	443		31
Riverton.....	87	103	16	
Shoshone.....	237	249	12	
INDIAN.				
Flathead.....	169	165		4
Fort Peck.....	9	9		
Blackfeet (exclusive of half time of 6-5 on St. Mary).....	14	12		2
Secondary.....	35	69	34	
Unassigned per diem.....	25	26	1	
Total.....	3,326	3,251	148	223
Net decrease.....				75

¹ Exclusive of 3 in Denver.

² July figures. Nothing reported for August and September.

³ August figures. Nothing reported for September.

OKANOGAN PROJECT, WASHINGTON.

September weather was cool except for an unusually warm spell from the 10th to the 20th.

Owing to heavy rains the latter part of August no water was delivered by the gravity system from the 1st to the 10th. The Robinson Flat pumping plant continued in operation, however, until it was closed for the season on the 24th. The Duck Lake and Government wells pumping plants were closed on the 23d

and different portions of the gravity system were shut down for the season from the 18th to the 30th.—*W. D. Funk.*

YAKIMA PROJECT, WASHINGTON.

September weather continued warm and dry.

Sunnyside Division.—Owing to the continued hot, dry weather, the demand for irrigation water was heavy until toward the close of the month, when it decreased steadily. The maximum diversion into Sunnyside Main Canal was 1,228 second-feet; minimum, 765; and average, 981. Between the 10th and 20th diversion was reduced below requirements, owing to difficulty in regulation of the storage supply, but water service was not seriously interrupted. All the pumping plants were operated throughout the month, except the small unit at Outlook plant which was closed down on the 19th on account of decreased demand for water. On account of low water in the Main Canal the delivery of the Prosser and Spring plants was considerably decreased. The maximum amount wasted over Sunnyside Dam was 300 second-feet, on the 7th. A total of 4,878 acre-feet was wasted during the month.

Tieton Division.—The demand for water had decreased sufficiently by the 5th to permit a reduction in the diversion of Tieton Main Canal below the maximum of 322 second-feet. Average diversion for the month was 267 second-feet; minimum, 154 second-feet. Water service was continuous except for a period of one hour on the 12th, due to the tripping of spillway No. 3 on account of line trouble. The principal features of maintenance work were the building of a road on the bank of lateral G along the Cowiche sidehill from flume 4 to the K lateral headworks, a distance of 4½ miles, and uncovering a portion of D-1 siphon for cleaning and painting.

Storage reservoirs.—The draft on storage was heavy and the supply was practically exhausted by the end of the month. Total quantity released was 95,568 acre-feet. Piling and burning of logs was continued at Keechelus and Kachess Reservoirs with good progress. Piling of logs was started at Bumping Lake on the 7th. Concrete blocks for repair work at CleElum Dam were completed and placing of same started on the 27th.—*J. L. Lytel.*

TIETON DAM.

The average force was 475 men. Labor continued scarce, especially during the latter part of September.

One hundred and one thousand cubic yards of embankment and 1,520 cubic yards of concrete were placed during the month. Good progress was made on the reservoir clearing. Lumber cutting was completed and the sawmill shut down. Coyote holes were completed on the spillway preparatory to blasting out the upper part of the spillway section.—*F. T. Crowe.*

RIVERTON PROJECT, WYOMING.

September weather was favorable for construction. The roads were in good condition. The flow of Wind River was about normal. There was a labor shortage throughout the greater part of the month, but toward the close it was possible to secure sufficient help. Placing of concrete was delayed owing to inability to secure sufficient cement on account of a freight embargo on the C. & R. G. Railway.

On the Wind River Diversion Dam drag line 121322 excavated 3,728 cubic yards of material for the weir

and screened gravel for concrete. Preparations for completing the weir were finished and placing of concrete in the weir was resumed on September 9; 2,025 cubic yards of plain concrete and 29 cubic yards of reinforced concrete were placed.

The excavation for the Pilot Butte Reservoir outlet was completed by drag line 121474 on September 12. This machine excavated 5,627 cubic yards, all sandstone.—*H. D. Comstock.*

SHOSHONE PROJECT, WYOMING.

September was a pleasant month, well suited to harvesting and construction work. There was a light frost in some localities on the 8th, which damaged only tender garden vegetation.

The inflow into Shoshone Reservoir was normal. The balanced valves at the dam were operated part of the month to lower the water surface in the reservoir as far as practicable, to provide storage space for spring river control in the interests of Willwood Dam construction.

The 36-inch balanced needle valve at the end of the Shoshone power plant by-pass was tested at the close of the month and found to operate satisfactorily. At the Willwood Dam the principal work was on camp and plant construction, although some work was done on the excavation of the south abutment. A class 14 electric Bucyrus drag line worked the entire month on the heavy excavation at the head of the Willwood Canal. On the Garland Division drainage work was continued with two class 9½ Bucyrus drag lines, one electric and one gas, and one P. & H. ½-c. y. machine. On the Frannie Division work was carried on by two class 9½ electric drag lines, one class 14 gas drag line, and one ½-c. y. P. & H. drag line.

The third cutting of alfalfa and the grain crop were practically harvested at the close of the month. Potato harvesting began about the middle of the month, and sugar-beet harvesting on the 25th. Crop yields, except alfalfa, promised to be slightly better than last year. One hundred and thirty-five carloads of potatoes were shipped from the project during the month.

A Ruth dredger was operated on the Frannie Division, cleaning 2.9 miles of ditch in 15 days, at a cost of \$125 per mile.—*J. S. Longwell.*

INDIAN PROJECTS, MONTANA.

BLACKFEET PROJECT.

September weather was mild and favorable for project work, as well as harvesting and threshing.

Construction work was continued both on canal excavation and concrete drop construction on Four Horns Reservoir outlet canal with a small force. Indians were employed and no attempt was made to ship in labor from outside the reservation.

The latter part of the month three of the canal systems on the project were operating to part capacity for fall irrigation. The demand for water was light.

Fair crops were harvested, whether irrigated or not, and, owing to exceptionally favorable weather conditions, most of the harvesting and threshing was completed at the end of the month.—*R. M. Snell.*

FLATHEAD PROJECT.

September weather conditions were excellent. Labor conditions were fair, with difficulty in maintaining full crews of efficient men.

At the Hubbard Dam stripping was continued by steam shovel and drag-line excavator, and 7,950 cubic yards of loose rock and mud removed. An air-compressor plant was set up and the construction of a screening plant and a concrete-mixing plant begun. A cement house was erected, and the contractor hauling cement was making good progress.

On the Tabor Feed Canal the steam shovel excavated 28,180 cubic yards of classes 1 and 2 material in 4,095 linear feet of canal. The clearing crew took the timber and brush off 5,950 linear feet of canal and shot out the large stumps. Wood for the steam-shovel fuel, amounting to 138 ricks, was sawed and split.

The operation and maintenance forces were reduced and used largely on maintenance work. About 3,200 acre-feet of water were delivered, 400 turnouts operated, and 4,200 acres of land irrigated. Construction of new work by operation and maintenance forces consisted of the excavation of 2,400 cubic yards of material in lateral extensions and the construction of seven road culverts, four drops, two turnouts, and two wasteways.

The third cutting of alfalfa was being harvested at the end of the month with a better yield than is usual.—*C. J. Moody.*

FOOT PECK PROJECT.

Prevailing weather conditions for September were excellent for crop harvest.

Canals and laterals were operated on the four divisions. The demand for water was light, some third cutting alfalfa and native bluejoint hay being the only acreage irrigated. General repairs of canals and structures were continued by the operating forces.

Backfilling of minor structures on the Big Muddy Division was completed.

Harvesting and threshing were practically completed. Owing to the prevailing dry weather little fall plowing was being done, and a considerable acreage of winter wheat was being planted on the stubble.—*E. L. Decker.*

GENERAL OFFICES.

Washington office.—Director Davis was in the field the entire month. He reported a successful termination of his trip with others down the stretch of the Colorado River, during which the Grand Canyon was visited. From Flagstaff he returned to the river at points lower down, including Boulder Canyon, going from there to Los Angeles and San Francisco, which he reached on September 29 for a stay of a week or so. He planned to go from there direct to Klamath Falls, Oreg., for the meeting of the board of review for the Klamath project, of which he is chairman, which has been designated by the Secretary to investigate the irrigable areas in Tule Lake Division and the irrigability of lands in Hanks Marsh.

During the absence of the director the office was in charge of Assistant Director Morris Bien as acting director, except for three days at the end of the month when he was in Chicago. During Mr. Bien's absence the office was in charge of Chief Counsel Hamele as acting director. Mr. Hamele returned to the office from an extended field trip on September 6.

Chief Accountant J. M. Luney, formerly chief clerk of the Denver office, became permanently connected with the force of the Washington office on September 18.

Consulting Engineer F. H. Newell, who returned the latter part of the month from a trip over a number

of the projects in company with Carl S. Scofield and A. C. Cooley, of the Department of Agriculture, went to Georgia to study the conditions of the unused lands in the southeastern part of the State, continuing the reconnaissance made by him in northern and western Florida last spring.

Galley proof of the twenty-first annual report was received from the printer late in the month, and portions relating to the various projects were sent to the field for corrections.

At the end of the month approximately 1,750 applications for relief had been filed by individual water users under the act of March 31, 1922.

During the month 135 purchase orders were placed, 6 advertisements issued, and 38 referred to the General Supply Committee. Purchases amounted to \$7,661.33. The storehouse filled 203 requisitions and made 27 sales from stock, the total value amounting to \$3,099.71.

Publications issued during the month comprised 59 copies of the annual reports and 253 miscellaneous

publications. The 24 mimeograph jobs amounted to a total run of 23,405 sheets.

At the end of the month the total number of inquiries from ex-service men concerning opportunities on the land amounted to 194,653.

The photographic laboratory turned out work during the month to the value of \$305.90, distributed as follows: Washington office, \$132.50; field, \$167.30; sales, \$6.10. In this connection it should be noted that the prices for photographic work were materially reduced on September 1, in some cases amounting to 50 per cent or more.

The following matters, among others, were acted on by the Secretary during the month:

Recommending approval of form of contract with the water users of the Belle Fourche project, providing for the organization of an irrigation district which would agree to pay the operation and maintenance deficit and construction deficit, together with all obligations under existing individual contracts, as a supplemental construction charge at the end of

Comparison between operation and maintenance estimates and results, January 1 to September 30, 1922.

Project.	Gross cost.				Net accruals and revenues.				Area for which water is available.
	Estimate for 1922.		Actual cost to Sept. 30.	Amount * over or under.	Estimate for 1922.		Actual returns to Sept. 30.	Amount more or * less than estimate.	
	Total for year.	To Sept. 30.			Total for year.	To Sept. 30.			
UNDER PUBLIC NOTICE.									
Belle Fourche.....	\$70,000	\$55,500	\$47,000	\$8,500	\$101,153	\$100,000	¹ \$100,000		Acres. 82,500
Boise.....	290,000	214,000	187,000	27,000	290,000	281,000	² 290,000	\$9,000	167,300
Carlsbad.....	52,000	38,500	48,300	*9,800	56,625	53,000	47,500	*5,500	25,000
Huntley.....	45,000	36,800	33,200	3,600	46,500	46,500	46,000	*500	30,000
King Hill.....	35,500	22,100	23,900	*1,800	³ 35,500	22,100	23,900	1,800	16,900
Klamath.....	55,000	49,000	38,000	11,000	³ 55,000	49,000	38,000	*11,000	51,000
Lower Yellowstone.....	36,000	30,000	23,000	7,000	³ 36,000	30,000	23,000	*7,000	40,200
Minidoka (South Side).....	94,000	72,000	61,000	11,000	95,300	79,000	96,000	17,000	49,000
Newlands.....	105,000	80,000	91,000	*11,000	121,000	120,500	123,500	3,000	72,200
North Dakota Pumping.....	35,000	30,800	26,000	4,800	³ 30,820	30,820	30,820		7,650
North Platte (Interstate).....	165,000	145,500	144,000	1,500	166,700	144,000	163,000	19,000	⁴ 130,000
Okanogan.....	37,000	31,500	38,000	*6,500	² 53,720	48,220	53,720	5,500	8,460
Orland.....	35,000	27,500	23,500	4,000	35,230	35,000	35,000		20,500
Rio Grande.....	231,000	191,000	183,000	8,000	² 233,945	193,945	185,945	*8,000	116,000
Shoshone.....	70,000	54,000	49,300	4,700	75,750	75,300	67,000	*8,300	71,100
Strawberry Valley.....	⁵ 25,000	18,800	18,000	800	⁶ 52,500	44,500	45,000	500	59,100
Sun River (Fort Shaw).....	14,000	13,400	12,000	1,400	15,600	14,500	13,600	*900	13,900
Umatilla.....	37,280	29,000	28,000	1,000	³ 37,280	29,000	28,000	*1,000	24,400
Yakima:									
Sunnyside.....	130,000	97,000	96,000	1,000	148,776	133,000	134,000	1,000	103,000
Tieton.....	84,000	57,500	60,000	*2,500	89,800	89,000	87,000	*2,000	32,000
Yuma.....	260,000	216,000	207,000	9,000	262,000	220,000	209,000	*11,000	63,200
Total.....	1,905,780	1,509,900	1,437,200	72,700	2,039,199	1,838,385	1,839,985	1,600	1,183,410
UNDER WATER RENTAL.									
Grand Valley.....	50,000	37,000	37,000		50,800	46,000	42,500	*3,500	38,400
Milk River (inc. St. Mary).....	71,500	59,000	44,800	14,200	22,000	22,000	20,500	*1,500	⁷ 74,000
North Platte (Fort Laramie).....	70,000	56,500	48,000	8,500	53,000	50,000	45,000	*5,000	43,400
Sun River (Greenfields and Big Coulee).....	25,000	23,800	19,800	4,000	30,000	29,500	² 14,500	*15,000	28,500
Uncompahgre.....	135,000	99,000	115,000	*16,000	142,500	80,000	53,000	*27,000	100,000
Total.....	351,500	275,300	264,600	10,700	298,300	227,500	175,500	*52,000	284,300
INDIAN.									
Blackfeet.....	30,000	26,200	15,600	10,600	19,700	19,500	6,200	*13,300	21,500
Flathead.....	65,000	55,000	41,000	14,000	58,000	58,000	37,000	*21,000	105,000
Fort Peck.....	14,600	12,700	11,000	1,700	1,000	800	600	*200	22,400
Total.....	109,600	93,900	67,600	26,300	78,700	78,300	43,800	*34,500	148,900

¹ Based on minimum charge.

² Estimated by Denver office. Figure not shown on project chart.

³ Returns regulated by district contract.

⁴ Includes 17,000 acres for which water is carried in main canal.

⁵ Not including tunnel repairs.

⁶ Includes installment of \$25,000 for tunnel repairs.

⁷ Stored water is furnished through the St. Mary Canal for 21,600 acres additional.

a 20-year period, aggregating \$1,394,502; approved September 25.

Reporting unfavorably on bill S. 3924, providing for extension of time for repayment on the Strawberry Valley project; signed September 12.

Recommending approval of a public notice opening to entry on October 27 at \$90 per irrigable acre 9,680.6 acres of Tule Lake land, Klamath project; approved September 29.

Denver office.—The chief engineer returned to the Denver office from a field trip on September 9. Early in September he and the director had a conference in Salt Lake City relative to the Utah cooperative investigations. On September 21 the chief engineer and the designing engineer left Denver for Las Vegas, Nev., in connection with the Boulder Canyon board meeting. Assistant Chief Engineer Charles P. Williams left Denver on September 30 for the Milk River project in connection with the work of the board of review. Engineer James Munn left Denver on September 19, and before joining the Boulder Canyon board on September 23 visited the Salt Lake Basin investigations. From Las Vegas, Messrs. Munn and Savage visited the Black Canyon dam site on the Boise project and the Baker project. W. A. Meyer assumed the duties of chief clerk of the Denver office on September 6, and Chief Accountant Luney left for Washington, D. C., on September 15.

On September 26 a board of engineers, consisting of Messrs. F. E. Weymouth, Louis C. Hill, A. J. Wiley, James Munn, J. L. Savage, and W. R. Young, reported on the construction program at Boulder and Black Canyon dam sites.

The principal work accomplished in the designing division during the month consisted of the following: Work of preparing designs for the Black Canyon Dam, Boise project, was continued; detail design for the Colorado River crossing, Orchard Mesa Division, Grand Valley project, was practically completed; designs were completed covering several structures on the King Hill project; designs were prepared for three checks in the Main Canal, Lower Yellowstone project; detail design was prepared for Dobson Lake control, structure, Indian Creek Drain, North Platte project; designs were prepared for two structures on the Wyoming Canal, Riverton project; detail designs for repairs to upper plunge basin, Strawberry Valley power plant, were completed; and designs were prepared for various structures on the lateral system, Yuma Auxiliary project. A preliminary design was prepared for diversion dam on the Pecos River.

The principal work accomplished in the electrical division consisted of the following: Work was continued in connection with the direct pumping units and sluice gates for the Black Canyon Dam, Boise project; preliminary estimates were made for a small power plant to be installed at the Pathfinder Dam, North Platte project; studies were made of the proposed power development on the Riverton project; estimates of the cost of the pumping plant for the Roza Division of the Yakima project were reviewed, and designs and specifications were prepared for the electrification of the Valley drainage plant, Yuma project.

The cost and property section arranged for the transfer of property in the amount of \$8,933.46, and the sales during the month totaled \$1,501.53.

The more important matters considered by the legal division were: Alleged infringement of Burnham patents for submerged orifices; application of

Union Pacific Railway Co. for additional right of way in the Fort Laramie Division, North Platte project; use of Government transmission lines by private parties. Okanogan project; and sale of supplemental water to lands outside of the Sunnyside Irrigation District, Yakima project.

The disbursing section handled 893 vouchers, involving an expenditure of \$173,025.25; and in the purchasing section 369 advertisements were issued. 383 vouchers were prepared, involving a net expenditure of \$87,557.21, and 378 bills of lading were issued to provide movement for materials purchased and transferred.

Spectacular Cloudburst on Flathead Project.

A cloudburst occurred in the Little Bitterroot River Valley of the Flathead Project on August 30, beginning with hail, followed by rain. This storm crossed the upper half mile of the Canas A Canal and swept through a small area of dry farming country destroying gardens and such grain crops as were not yet harvested, washing out roads and small bridges and culverts on the road to Hubbard Reservoir.

The canal is located at the foot of steep mountain slopes, which are heavily timbered with pine, fir, and tamarack. The hail storm which preceded the rain clipped small branches from the trees and the flood from the heavy rain swept the branches and hailstones down the slopes into the canal. Sand and gravel were also carried into the canal from coulees, where the flow of water collected. The canal, which is 150 second-foot capacity, was filled entirely to the top of the bank with hailstones packed in the pine needles and branches. A small head of water running in the canal was forced over the bank, causing a small break. On account of the protection afforded the hail from the needles and branches, the process of melting was slow and it was necessary to shovel out a channel after cleaning out the sand and gravel bars with team forces, in order to get water through the canal. Some of the hailstones were more than 2 inches in diameter.

Severe hailstorms and cloudbursts are very exceptional on the Flathead Project.

Water versus the Hoe.

"If you were to criticize your neighbors, what would you say is the biggest mistake they make?" This question was asked a farmer who always raises good crops.

The answer was: "That of trying to make water take the place of cultivation."

Field crops will not grow without water; neither will they grow without air, so loosen up the soil.

Watch results and don't make the same mistake next year.—*Organized Farming, Rio Grande project.*

ADMINISTRATIVE ORGANIZATION.

DEPARTMENT OF THE INTERIOR.

HON. ALBERT B. FALL, Secretary of the Interior.
 EDWARD C. FINNEY, First Assistant Secretary.
 FRANCIS M. GOODWIN, Assistant Secretary.
 EDWIN S. BOOTH, Solicitor for the Interior Department.
 CHARLES V. SAFFORD, Administrative Assistant to the Secretary.
 MORGAN R. BROCK, Assistant to the Secretary.
 HARRY G. CLUNN, Private Secretary to the Secretary.
 JOHN HARVEY, Chief Clerk and Superintendent of Buildings.

U. S. RECLAMATION SERVICE.

WASHINGTON, D. C.

Arthur Powell Davis, director; Morris Blen, assistant director; Ottomar Hamele, chief counsel; J. B. Beadle, director's assistant; C. J. Blanchard, statistician; Hugh A. Brown, editor and office assistant; C. A. Bissell, engineer; J. M. Luney, chief accountant; C. A. Lyman, repayment accounting; Miss H. A. Fellows and Raymond Depue, fiscal agents; C. H. Fitch, chief clerk; Emmet Carr, purchasing agent; G. W. Numbers, appointment clerk; H. N. Bickel, Yakima, Wash., and W. F. Kubach, Denver, Colo., examiners of accounts.

DENVER, COLO.

F. E. Weymouth, chief engineer, Wilda Building, Denver, Colo.; R. F. Walter and C. P. Williams, assistant chief engineers; Miss L. H. Meisel, secretary to the chief engineer; J. M. Gaylord, electrical engineer; J. L. Savage, designing engineer; James Munn, engineer; W. A. Meyer, chief clerk; A. McD. Brooks, purchasing agent; Harry Caden, fiscal agent.

FIELD LEGAL OFFICES.

Boise, Idaho.—B. E. Stoutemyer, district counsel. Projects: Boise, Minidoka, King Hill, and Jackson Lake Enlargement.

Denver, Colo.—Law section office of chief engineer: R. M. Patrick and Armand Offutt, district counsel.

Las Cruces, N. Mex.—Mark B. Thompson, attorney. Projects: Rio Grande, Carlsbad, and Hondo.

Helena, Mont.—E. E. Roddis, district counsel, Helena, Mont. Projects: Blackfeet, Flathead, Fort Peck, Huntley, Milk River, St. Mary Storage, Sun River, North Dakota Pumping, Lower Yellowstone, and Shoshone.

Mitchell, Nebr.—J. N. Beardslee, district counsel. Projects: North Platte, Belle Fourche, and Riverton.

Montrose, Colo.—J. R. Alexander, district counsel. Projects: Grand Valley, Uncompahgre, and Strawberry Valley.

Portland, Oreg.—H. L. Holgate and D. G. Tyree, district counsel. Projects: Yakima, Okanogan, Umatilla, Klamath, and Baker.

San Francisco, Calif.—P. W. Dent and Brooks Fullerton, district counsel, 349 Pacific Building. Projects: Salt River, Yuma, Orland, and Newlands.

PROJECT ORGANIZATION.

Belle Fourche Project.—B. E. Hayden, project manager, Newell, S. Dak.; R. C. Walber, chief clerk.

Boise Project.—J. B. Bond, project manager, Boise, Idaho; Walter Ward, engineer in charge construction Black Canyon Dam; E. R. Mills, chief clerk; C. F. Weinkauff, fiscal agent.

Carlsbad Project.—L. E. Foster, project manager, Carlsbad, N. Mex.; V. L. Minter, chief clerk and fiscal agent.

Grand Valley Project.—S. O. Harper, project manager, Grand Junction, Colo.; C. H. Young, chief clerk; A. H. Hall, fiscal agent.

Huntley Project.—A. R. McGinness, project manager, Ballantine, Mont.; G. H. Bolt, chief clerk; Miss M. C. Simek, fiscal agent.

King Hill Project.—A. M. Rawn, project manager, King Hill, Idaho; T. W. Hause, chief clerk; W. S. Gillogly, fiscal agent.

Klamath Project.—H. D. Newell, project manager, Klamath Falls, Oreg.; N. G. Wheeler, chief clerk; G. R. Barnhart, fiscal agent.

Lower Yellowstone Project.—L. H. Mitchell, project manager, Savage, Mont.; C. A. Denman, chief clerk.

Milk River Project.—G. E. Stratton, project manager, Malta, Mont.; H. A. Parker, engineer; E. E. Chabot, chief clerk; G. S. Moore, fiscal agent.

Minidoka Project.—Barry Dibble, project manager, Burley, Idaho; Dana Templin, engineer; E. C. Diehl, chief clerk; Miss A. J. Larson, fiscal agent; F. A. Banks, engineer, American Falls, Idaho.

Newlands Project.—J. F. Richardson, project manager, Fallon, Nev.; A. W. Walker, engineer; G. B. Snow, chief clerk; Miss Ethel M. Simmonds, fiscal agent.

North Dakota Pumping Project.—W. S. Arthur, project manager and chief clerk, Williston, N. Dak.; H. C. Melaas, fiscal agent.

North Platte Project.—Andrew Weiss, project manager, Mitchell, Nebr.; H. W. Bashore, engineer, Fort Laramie Division; Paul Rothi, irrigation manager; J. R. Ummel, chief clerk; Mrs. A. L. Truax, fiscal agent.

Okanogan Project.—Calvin Casteel, project manager, Okanogan, Wash.; W. D. Funk, chief clerk and fiscal agent.

Orland Project.—R. C. E. Weber, project manager, Orland, Calif.; E. T. Erksen, engineer; C. H. Lillingston, chief clerk and fiscal agent.

Rio Grande Project.—L. M. Lawson, project manager, El Paso, Tex.; T. W. Parry, irrigation manager; C. A. Peavey, chief clerk; L. S. Kennicott, fiscal agent.

Riverton Project.—H. D. Comstock, project manager, Riverton, Wyo.; R. M. Conner, engineer; G. H. Murphy, chief clerk; W. J. Fogarty, fiscal agent.

St. Mary Storage Division.—R. M. Snell, project manager, Brown- ing, Mont.; F. H. Shiner, chief clerk and fiscal agent.

Salt River Project.—Being operated by the Salt River Valley Water Users' Association; C. C. Cragin, general superintendent and chief engineer, Phoenix, Ariz.

Shoshone Project.—J. S. Longwell, project manager, Powell, Wyo.; J. R. Iakisch, engineer; C. M. Jump, superintendent of irrigation; W. F. Sha, chief clerk; Miss L. C. Drinkwater, fiscal agent.

Strawberry Valley Project.—W. L. Whittemore, project manager, Provo, Utah; J. E. Overlade, chief clerk and fiscal agent.

Sun River Project.—G. O. Sanford, project manager, Great Falls, Mont.; H. W. Johnson, chief clerk; Miss M. G. Valentine, fiscal agent; G. A. Benjamin, irrigation manager, Fairfield, Mont.

Umatilla Project.—H. M. Schilling, project manager, Hermiston, Oreg.; G. C. Patterson, chief clerk and fiscal agent.

Uncompahgre Project.—L. J. Foster, project manager, Montrose, Colo.; R. B. Smith, chief clerk; F. D. Helm, fiscal agent.

Yakima Project.—J. L. Lytel, project manager, Yakima, Wash.; R. C. Cunningham, chief clerk; J. C. Gawler, fiscal agent; M. D. Scroggs, superintendent of irrigation, Sunnyside, Wash.; J. S. Moore, superintendent of irrigation, Route 6, Yakima, Wash.; F. T. Crowe, engineer in charge construction Tieton Dam, Rimrock, Wash.; C. F. Gleason, engineer; V. G. Evans, chief clerk; C. B. Funk, fiscal agent.

Yuma Project.—P. J. Preston, project manager, Yuma, Ariz.; R. M. Priest, superintendent of construction; S. A. McWilliams, engineer, Yuma Mesa Division; E. R. Scheppelmann, chief clerk; E. M. Philebaum, fiscal agent.

INDIAN PROJECTS.

Blackfeet Project.—R. M. Snell, project manager, Browning, Mont. F. H. Shiner, chief clerk and fiscal agent.

Flathead Project.—C. J. Moody, project manager, St. Ignatius, Mont.; S. A. Kerr, engineer in charge construction Hubbard Dam; J. M. Swan, chief clerk; J. P. Siebeneicher, fiscal agent.

Fort Peck Project.—E. L. Decker, acting project manager, Poplar, Mont.; Henry Berryhill, chief clerk and fiscal agent.

The Reclamation Record

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On the Tule Lake Division of the Klamath Project, Oregon-California, are a number of desirable farm units available for entry by ex-service men of the World War. The illustrations show the change in one year on similar land from a tule-covered lake bed to farm land in a high state of agricultural development. (See page 285.)

WOMAN ROSE GROWER MAKES FIRST PAYMENT ON RIO GRANDE PROJECT COST.

MRS. MATTIE P. GRAVES, of Ysleta, Tex., has made the first individual payment to the El Paso County Water Improvement District No. 1 on the construction cost of the storage, irrigation, and drainage works of the Rio Grande project. The first installment of the construction costs to be paid by the property owners of the district will be on 33,560 acres of land at the rate of \$1.80 per acre, or a total of \$60,408. The district directors presented to Mrs. Graves, with an especially prepared receipt, a framed tinted photograph of Elephant Butte Dam and a letter of commendation signed by Director A. P. Davis and Assistant Director Morris Bien. In this letter the director and assistant director express their gratification in learning that Mrs. Graves is the first landowner to tender payment, and by so doing to bear out the faith which the Reclamation Service has steadfastly maintained that proper appreciation of reclamation works would not be lacking on the part of the people benefited.

"El Nido," the 33-acre farm which is located 1 mile north of Ysleta, was bought by Mr. and Mrs. Graves in 1906, eight years prior to the time when the control of the irrigation works in the El Paso District was taken over by the Reclamation Service. The price paid for the entire acreage at that time was \$525, and to-day the same figure offered for 1 acre is not regarded as a temptation. The farm is now one of the best developed on the project, consisting of 15 acres of pears, 17 acres of alfalfa, and 1 acre of roses.

Mrs. Graves devotes her time very nearly entirely to the cultivation of roses and makes disposition of the daily cuttings to one of El Paso's leading florists. On the 1 acre she raises 30 varieties, but of these there are 6 varieties which she says are best adapted to the climate and soil of the El Paso Valley—the American Beauty, Kaiserine Augusta Victoria, Hoosier Beauty, pink and red Radiance, Sunburst, and the Aaron Ward. It is not easy to believe, upon seeing Mrs. Graves's garden and its popular products, that during her early life in a mining camp she did not see flowers of any description or that she began the cultivation of roses in the year 1910 without the least experience. In 1916, at the International Soil Products Exposition held in El Paso, her exhibit of 12 varieties of roses won blue ribbons, two cups presented by the Rio Grande Valley and City National Banks of El Paso, and sweepstakes. In May, 1922, and again in October, 1922, at the El Paso Flower Show blue ribbons and highest honors were carried off by the roses grown at "El Nido."

When Mrs. Graves isn't raising roses she is reproducing with her canvas and brushes and oils the surrounding landscape, which with its background of distant rugged mountains furnishes an interesting

subject for that which she is disposed to regard as a "pastime."



Mrs. Mattie P. Graves.

Mr. Graves finds that his greatest profit is returned from the growth and sale of alfalfa and pears. He knows irrigation; he served as superintendent of the irrigation system which stretched from El Paso to Fabens, Tex., before the purchase of the Franklin Canal by the Reclamation Service. Water supply then depended upon the extent of the flow in the Rio Grande, which was very erratic and was attended, he said, with many more difficulties than are experienced at the present time with water under control at Elephant Butte Dam. At the time of the World War Mr. Graves enlisted in the tank corps of the Three hundred and thirty-first Battalion and was sent to France, and during the year of his absence Mrs. Graves superintended the farming operations.

"El Nido" farm has returned an ample living for Mr. and Mrs. Graves since they started cultivation of the entire area in 1906, enough to build a comfortable and attractive home, enough to pay the first installment on construction costs without embarrassment, and enough so that they are free from indebtedness of any description.

SHORT STORIES OF SUCCESSFUL SETTLERS.**Gathered from the Project Press and People.****By C. J. Blanchard, Statistician.**

OUR first recollection of the Black Hills is a throw-back into boyhood days in the stirring western period when Indian fights and gold discoveries in this region occupied much space in the newspapers and furnished material for the writers of yellow-back literature, so popular with youthful readers. Our next memory is of a trip by stage from Chamberlain to Deadwood before the railway came. Great changes have occurred since then in the Hills. Gone are the bad men. No more the festive cowboys dash through the narrow streets shooting up the town. The clink of chips and the invitation of the gambler to place your bets on the roulette wheel no longer are heard through open doors by the passer-by. The all-night dance halls, the wide-open saloons, are closed. From the hills and along the dashing streams the placer miner has vanished. In their place enormous stamp mills, great shops, long lines of tramways and elevated tracks are ceaselessly working with the great masses of gold-bearing rocks torn from 2,500-foot levels beneath the mountains. Modern buildings of stone and brick stocked with the manufactured products of the East have taken the place of the old frame shacks. Well-lighted paved streets follow the winding trails of early days. The hills are adorned with beautiful and artistic homes. With an appreciative vision of the value of the natural charms in which the Hills abound, progressive citizens and an intelligent State government have expended millions in making these accessible. Where in my youth only a hardy mountaineer could go, to-day wide highways as smooth as a city boulevard lure the tourist into a veritable wonderland. Infinite variety characterizes the scenery of the Hills, and it never tires. You must remember that the Black Hills region is an irregular, dome-shaped anticline embracing a total area 125 miles long by 60 miles wide, set in the midst of a wide area of plains sloping toward the east. Its name traces back to the Indians, who called the region Paha (Hills) Sapa (Black), and for whom during uncounted centuries it was a favorite hunting and camping ground.

During the geological period, when the Alps were slowly lifting their summits above the ocean, the Black Hills were upthrust from the bed of an inland sea which extended from the Arctic to the Gulf of Mexico.

In the passing of ages the waves of the ocean and the fierce storms wrought their will with the granite uplift, wearing down the rocks and building up the

valleys below. It was a tropical region in those long-vanished times, and as the seas receded life in many strange forms appeared. The vegetation was luxurious. Magnificent forests, enormous palms, and other water-loving plants abounded. On the shores of marshy lakes, over the wide grassy meadows, and in the shadowy glades wandered innumerable species of prehistoric mammals, many of gigantic size. Long before the coming of man all these had vanished and only a few descendants, by adoption of form and characteristics to meet the changing climate, still survive. The Titanotherium, South Dakota's hippo; the saber-toothed tiger; the camel; and other wonderful types are gone forever except as the rain and the wind uncover their bleached bones to our wondering eyes.

The traveler entering the Hills from Rapid City and from the east looks upon a most pleasing prospect. The city fronts upon seven valleys, each in a high state of cultivation and merging into a broad expanse of rolling plains. The Hills on the west rise sharply, covered with fine forests of dark green. The Hills are gashed with deep canyons, through which a dozen sparkling streams descend. One of these, Rapid Creek, clear as crystal, flows through a gorge, affording a most delightful trip by rail. Along the route in pleasant wooded parks are the summer homes of many people. At Hisega is a populous summer camp where hundreds of families find recreation and health. Our return from this canyon trip on the speeder was a thrilling adventure.

The visitor who enters from Spearfish on the north will doubtless pass through Belle Fourche Valley, where the alchemy of irrigation has wrought a miracle. If he be country-minded or desiring to invest in land, it will repay him to prolong his stay in the valley, because there are real bargains here. Spearfish, the site of the State Normal School, is almost hidden from view amid the trees. This is a colorful country. Great ledges of red and pink sandstone outcrop, and the canyon of Spearfish Creek is one of the wonders of the West. It is also the Nimrod's paradise. The excellent highway makes accessible a region of ever-changing charm; the waterfalls, cascades, and rapids are especially beautiful. Rough Lock and Bridal Veil Falls present unforgettable pictures.

The State highway, a splendid engineering feat, leads into fairyland through the State park and the game reserve. In the latter are several hundred bison and a hundred lordly elk. The State Lodge in

the park and the State Inn at Sylvan Lake are under supervision of the park commissioner, and the accommodations and rates are most pleasing to the tourist. By way of the park road we enter a region of grotesque and marvelous rock carving. Great rock pillars and colossal obelisks tower above us. We pass through giant granite columns into tunnels bored through crevices, and wind in and out of cathedral aisles of lofty pinnacles. In the distance needle-pointed spires rise a mile above the highway, crowned by Harney Peak, whose bare summit reaches the highest elevation in the United States west of the Rockies.

Where beauty abounds on every hand it is difficult to decide which spot holds the palm. This at least can be said without fear of contradiction: Sylvan Lake is the most restful place in the hills. From the lake the tourist who is unhurried will surely ascend Harney Peak, 7,300 feet above sea level. The horseback trail leads almost to the summit, and the rest of the way is not arduous. On top the view is indescribable. It gives a feeling of exaltation and uplift which can not be defined. Perched upon the extreme summit, which is a flat block of granite about 12 feet square, is the Lookout, the home of the forest ranger, whose watchful eyes are ever alert for smoke of careless campers' fires and whose telephone quickly calls out the guardians of the forest.

Deadwood offers much to the tourist, both in the city and in its surrounding country. On the summit of Mount Roosevelt near by the pioneers have erected a massive tower to the memory of the great hunter-naturalist. To this shrine thousands come each year. Lead, the Golconda of the Hills, is often described as occupying the center of the richest 100 square miles in the world. Here are located the principal works of the great Homestake Mine, which has produced more than \$200,000,000 in gold and is adding \$7,000,000 each year to the Nation's supply.

The tourist is permitted to see the operations of this fine plant, guides being provided to show him about. We had the rather unique privilege of handling a gold brick worth \$30,000, but it was under the watchful eyes of a guard armed with a sawed-off shotgun.

The Black Hills region deserves to be better known to the tourists of America. It offers so much, its scenery is so accessible and of such extraordinary variety, the accommodations in camp or city are so excellent that where only hundreds see it to-day thousands should so do. Hospitality is always on tap here.

In our next issue we shall tell of our visit to the Belle Fourche Valley and a side trip to the Bad Lands.

Few transcontinental travelers have more than a slight appreciation of the enormous area of Montana. Viewed from the Pullman windows, most of its natu-

ral beauty is never revealed. A journey across the State from east to west covers a mileage as great as one from Washington, D. C., to Jacksonville, Fla. On the trip last summer from the Flathead project to Milk River and Huntley projects the distance covered by rail was 1,073 miles, entirely within the State. To this must be added probably 500 miles by automobile.

Moistened by abundant and frequent showers, Milk River Valley was looking its best. For nearly 200 miles it stretched out, a landscape of vivid green prairie clothed in luxuriant native grasses. Owing to copious rainfall, irrigation had been neglected, although there was plenty of evidence in cultivated fields that larger yields would have resulted from the use of ditch water. The progress of the valley is still retarded by the presence of too many settlers who are land poor. The old-timers, mostly engaged in stock raising, have not yielded to changing conditions brought about by the elimination of the free range through settlement by dry farmers. They have suffered heavy losses in the falling prices of cattle, but are still loath to get down to real farming. Their large holdings are proving to be a liability, and the burdens of taxes, interest, and water assessments are heavy.

In a journey of 300 miles by auto the number of honest-to-goodness farmers could be counted upon the fingers of two hands. Their comfortable and prosperous farmsteads were oases in a vast unproductive region, and showed what practical farmers can accomplish here. Realization of the imperative need of changing the methods of agriculture and of bringing in a lot of real farmers, is coming. This year groups of owners of large holdings are cooperating with the railway company in an effort to colonize these lands. Long-time options, easy terms, and low prices are being offered. Settlers are coming in to look the valley over—a few have remained. The conditions are becoming just right for the homeseeker with some capital to acquire a good farm on terms which are liberal and encourage the hope of future success.

The Government, which holds a lien on these lands for the cost of the irrigation works, has little reason to fear for its investment. It asks no interest and the assets, although not liquid, are ample. With the landowner groaning under his burdens of mortgage and taxes and the banker and loan company clamoring for repayment of advances, the condition is different. Bankruptcy and foreclosure are imminent, but extremely undesirable. Both can be avoided by bringing together debtors and creditors in working out practical plans for disposing of excess lands to bona fide settlers who will make them produce. This, of course, can be done only by putting such a valuation on the land as will make it attractive to purchasers and by granting terms which will make the

success of the farmer possible. Present owners must expect to forego the dream profits of war-time valuation. Bankers and loan agents will have to extend their loans and perhaps be willing to grant some credit to deserving newcomers. The situation is by no means hopeless, although the remedy is rather drastic. The big landowner who has been holding his land for a fancy price is in exactly the position of the merchant who has overstocked and finds his market sagging. In such case the latter marks down his goods to bargain levels and tries to get rid of surplus. When conditions are serious he sells at a loss. The landowner must do the same.

For a farmer who is accustomed to the vigorous climate of this northern latitude the Milk River Valley offers excellent opportunities. The irrigation system is well built; water is available for thousands of acres never touched by plow. The communities are well established with modern schools, good roads, and transportation close at hand.

COMMENT OF A PROMINENT CLERGYMAN OF NEW JERSEY.

The reclamation views came O. K. We had from 75 to 80 out last Sunday evening for our services, and afterwards gave the picture show. It was quite an educational eye opener for the people here to learn what Uncle Sam was doing to make crops grow in the desert. I read Isaiah 35, and said the pictures showed how our Federal Government was active to fulfill the beautiful prophecy.

Isaiah said, "The wilderness and the solitary places shall be glad for them, and the desert shall rejoice and blossom as the rose. It shall blossom abundantly and rejoice even with joy and singing."

Reclamation reels last month were released to Sunnyside, Wash., Riverdale, Md., Waltham, Mass., Fairton, N. J., College Park, Md., St. Louis, Mo., and South Milwaukee, Wis. Two complete reels illustrating operation of various types of Bucyrus dragline machines on our projects were assembled for the Bucyrus Co. for use by its foreign-sales department. These reels will be shown in many parts of the world. The laboratory is now assembling two reels of selected scenes on Indian reservations for the use of the Bureau of Indian Affairs. One reel of Zion National Park has been furnished to the Union Pacific Railway for use by a noted lecturer who has a number of engagements in Missouri. Two reels of the Black Hills scenario have been delivered to the Belle Fourche Water Users' Association, and another set to the civic organizations of the Hills. One reel of Utah's scenic wonders has been forwarded to the Ogden Chamber of Commerce.

Commissioner Spry, of the General Land Office, in a recent address before the Kiwanis Club of Denver,

discussed national reclamation from a new angle which should be, but as yet is not, comprehended by the East. He took for illustration a single irrigation project where but a few years ago the land was uninhabited desert, and described in pungent sentences the direct benefits to the East which are steadily flowing from this Government work. The thousands of cars loaded with the products of mill and factory, running into millions of dollars annually, which were sold to these communities owed their market to the efficient work of the engineers. He made clear that reclamation transforms waste into wealth and puts people on soil that for uncounted ages has yielded nothing of value. Opposition to the expansion of this work is shortsighted and indicates on the part of the East a failure to realize that every acre of Government land that becomes self-supporting is an asset to all States as well as to the particular one in which that acre is located.

Once land becomes productive the increment from it flows into all the channels of trade and commerce. Other sections of the country little realize how directly they benefit in the results of reclamation enterprises in the Western States. If they can be brought to see it in the form of dollars and cents and shown that the self-reliant and industrious rancher under a great Government-built dam is a prospective customer for a Michigan-made automobile or piano built in New York State, the scales may fall from their eyes and they may then view the relation of redeemed acreage to the general prosperity of the United States.

WHAT OTHERS HAVE DONE YOU CAN DO.

Salt River project, Arizona.—Twenty-two fat hogs, marketed by Louis Groehler, of Mesa, averaged 164 pounds at six months, and topped the market at 10½ cents per pound.

After weaning, the pigs were given a small quantity of oil meal and tankage mixed in water. They were given 25 sacks of milo heads and then changed to rolled barley in a self-feeder. They had free access to a Bermuda and alfalfa pasture at all times.

According to actual weights of the pigs and a close estimate of the feeds consumed, gains were made at the rate of one pound gain from four and one-half pounds of rolled barley, besides the pasture.

"If you start the pigs with good tankage, oil meal, and skim milk after weaning," said Mr. Groehler, "they will not receive a setback. After they reach 100 pounds weight, pasture and rolled barley fed from a self-feeder will make cheap gains. These pigs were fattened in the hot weather, but they will gain faster in the winter. As near as I can figure, they returned 2½ cents per pound for the grain fed them."

These figures show that hog raising should be profitable in Arizona. At the present time half the hogs used for slaughter are being shipped into the State. Hogs offer a special market for home-grown grains, and they should make money for the feeders.

Grapes from the B. F. Carper vineyard on North Central Avenue Boulevard sold this year on the Boston market for \$3.30 a crate of 25 pounds. The yield

on this vineyard of 1½ acres was 836 crates, or nearly 600 crates to the acre. The grapes for the vineyard sold for \$1,970 an acre. This, the first carload shipped by the Arizona Grape Growers' Association, was shipped by express and charges were higher than freight shipments. Even with high costs of express and icing, the grapes netted the grower \$1,170 an acre, less commission. The fact that Salt River Valley grapes mature in advance of the grapes from the other grape-growing districts of the country gives this section a distinct advantage as a shipper of fresh grapes, for the product reaches the eastern market before the heavy shipments begin, hence prices are good.

Two herds of dairy cows in the Maricopa County (Ariz.) Cow Testing Association averaged a production for the herd of more than 34 pounds of butter fat each for the month and one herd with just a little under 34 pounds.

The Hay Marketing Association of the Salt River Valley, organized in June of this year, will market about 10,000 tons of hay this season, at a profit to the members of \$4 to \$5 a ton.

Orland project, California.—The superior quality and diversification of Orland's crops emphasize the need of a cannery to utilize the large surplus which each year is wasted. The establishment of a cannery should invite the hearty financial support of the business men whose interests will be greatly benefited. The producers are not able to furnish all the capital required, nor should they be expected to when the industry is one of general importance to the community. A first-class cannery gives employment to many people during slack periods, brings large sums of money into the community, and utilizes profitably products which otherwise are wasted.

The project this season will market more than six carloads of almonds, the largest crop recorded. Prices are good, and the growers are making a fine profit from their orchards.

Uncompahgre project, Colorado.—Our old friend John Howell, of Olathe, is at it again. Year after year John gathers in a lot of cash prizes in the great exhibitions throughout the country with his samples of Uncompahgre Valley's superior products. Just to prove that time has not lessened his ability to put other contestants in the "also ran" class, he sent three 1-bushel samples of wheat to the International Wheat Show at Wichita, Kans., from his own and other farms and walked off with three first prizes for the project. His favorite type is the Black Hulled Turkey Red, which has been a consistent winner for several years at many shows.

Canada, which for a number of years, largely by reason of greater care in clearing and sorting, won the blue ribbon, is now in third place, the Uncompahgre varieties holding first and second. Kansas's favorite seed wheat is the Turkey Red.

Boise project, Idaho.—Boarding houses throughout the land will rejoice to learn that there will be no shortage in the prune crop this winter. All the drying warehouses of Boise Valley are loaded to capacity with delicious prunes of the best quality. In one of these plants a half million pounds were piled up before being processed and dried.

Large crews are now engaged in evaporating apples. The fruit crop of Boise Valley was a huge one this season.

Minidoka project, Idaho.—That sheep on irrigated farms on the Minidoka project will prove a good

investment and that more farmers here should go into the business is the opinion of W. R. Peterman, well-known farmer of the Pioneer district, who cites his own experience to prove his contention:

"During the last two years farmers on our project have been going into stock raising to consume their surplus feed," he said. "Some have taken to dairying, poultry, and hog raising. I believe a small flock of sheep to be profitable on our farms also.

"A year ago I bid on 10 head of grade ewes and their lambs at a sale, costing me \$36. We had 16 lambs from these ewes and clipped 110 pounds of wool that brought \$17, sold three wethers that brought in \$21, and butchered five of the wether lambs during the fall and winter, keeping eight of the ewe lambs over, and this increased my flock to 18 ewes.

"These ewes raised 21 lambs, about 50 per cent. The wool from the 18 ewes brought \$65, and the lambs sold brought \$144, a total of \$209 income from my 18 ewes.

"So I have come to the conclusion that sheep will bring returns of \$50 an acre for all hay and pasturage consumed by them, besides fertilizing the land and increasing the yields of your beets, potatoes, and other crops.

Mr. Peterman is increasing his flock, which now numbers 60 head.

Sun River project, Montana.—People of the Simms community showed recently that they have the products to put on an agricultural exhibit that will bear inspection alongside the best that Montana or any other State can produce.

The exhibit room at the schoolhouse was crowded with people to view the exhibits. The departments attracting the most attention were the corn and fruit. There was keen competition in the corn show, with a dozen or more exhibitors. Mr. Crabtree had a fine assortment of his fruit at the fair. He harvested several hundred boxes of apples this season and has some as fine Wealthy and Duchess as ever grew anywhere.

Newlands project, Nevada.—The service rendered to some of our projects by the faith, enthusiasm, and perseverance of a few men is often of incalculable value. A notable proof of this statement is evidenced in the career of C. G. Swingle, who early in the history of the project planted a considerable acreage in deciduous fruits on the bench near Fallon. His experiment was made notwithstanding a project-wide belief that failure was sure to follow. At last his faith has been rewarded by a successful demonstration that favorably located areas in the valley are eminently adapted to the growing of certain varieties which attain a degree of perfection here, commanding ready markets and good prices. His example naturally is being followed by others, and in time the production of apples, pears, and cherries will be in quantities large enough to warrant cooperative marketing in carload lots.

Potatoes by parcel post at the rate of a ton a day will strike most people as something novel, yet this is what Newlands project farmers have been doing for some time. Large quantities of carrots, cabbages, celery, and poultry products are being marketed in the same manner.

Keep your eyes on Lahontan Valley, where intensified farming, cooperative marketing, and high-class products are bringing prosperity and contentment. From 21 acres of melons this year Mr. Chamberlain harvested 3,000 crates, half of which were put on the

market. The other half of the crop went into seed production, from which a ton of selected seed is expected.

Mr. Chamberlain's efforts this year also yielded between 400 and 500 crates of tomatoes from less than an acre of land. Other vegetable crops were harvested. The return enabled the grower to make a substantial payment on an 80-acre ranch on which he will plant 50 acres of melons next season.

Rio Grande project, New Mexico-Texas.—What experienced cotton growers think of the Mesilla Valley is best told in the words of W. H. Lee, of Barstow, Tex., who has been a successful planter in the Pecos Valley. In a recent interview Mr. Lee said: "Here you have every factor to make the cotton business a very great success. The climate and growing season are ideal, the water supply is more than ample, and the charges are low. The district is absolutely free from boll weevil and other cotton pests. The long staple and whiteness of cotton grown in the Mesilla Valley gives it a greater value than that produced elsewhere."

Five hundred thousand dollars, of which amount it is expected to place at least \$250,000 this year, will be available for farm-loan purposes in the Elephant Butte irrigated district.

Lower valley farmers face the best prospects they have seen for 10 years, County Farm Agent Herbert C. Stewart reports after a trip to Clint.

"Mercantile obligations have been wiped out, paper held by local banks has been taken up," said Mr. Stewart.

"New purchases are being made and the farmers are preparing to do larger things next year."

The success of the El Paso Bartlett Pear Association and of the Elephant Butte Alfalfa Association, which as a child of the county farm bureau, of which Mr. Porcher is president, has grown into the Texas-New Mexico Exchange, is encouraging the organization of more local bureaus in the valley.

El Paso's home-products show, recently closed, was one of the most impressive exhibitions the city folks have ever seen. The exhibits were numerous, and served to enlighten a public which has long been ignorant and indifferent to the potential resources of its own neighborhood. It is believed that the exhibition will stimulate the farmers to greater production and at the same time will arouse in the hearts of the consumers a loyalty to home-grown crops.

Millions of dollars annually expended by town people in California fruits and vegetables if paid to home farmers would materially increase the prosperity of the whole community. The exhibition brought the city and country together, and much good to both resulted. Prosperity has come to our project farmers after severe struggles. It can be made permanent by the cooperation of the urban population supporting the producer of the food crops.

Umatilla project, Oregon.—The Umatilla project is fast coming to the front as a dairy center. The Hermiston Creamery reports churning in one day 12,300 pounds of butter, one of its record days.

Every year more of the farmers on the project are going into the dairy business, and indications point toward this section being one of the best dairy countries in the Northwest within a few years.

In competition with the entire Pacific Northwest oats raised on the irrigated lands of the Umatilla

project scored first at the Northwest Hay and Grain Show held at Pendleton the week of the round-up. The oats were grown on the P. P. Sullivan ranch just south of Hermiston, and he received a check for \$20 from the fair association. Mr. Sullivan also had some corn on exhibition at the dairy show which measured 16 feet in height.

During the past year the Umatilla Bee Keeper's Association increased its membership nearly 200 per cent. At present 31 beekeepers, with about 3,500 colonies of bees, are enrolled in the organization. The total crop of honey produced by them this season was considerable more than 300,000 pounds. More than \$2,300 worth of supplies and containers were this year ordered through the association, with a saving to the members of from 10 to 25 per cent. The selling of honey by the association is still in the experimental stage. Practically all the honey is sold by the producers themselves, but at the price agreed upon by the members. This price is 10 cents per pound to dealers and 12 cents when sold to the consumer in 60-pound containers.

Sweet potatoes that averaged more than 400 bushels to the acre and some Netted Gems that made 648 bushels to the acre were brought to Hermiston by A. D. Smith from his farm 7 miles southwest of town. One of the sweet potatoes of the Nancy Hill variety weighed a little over 3 pounds.

This section will produce the finest potatoes in the country.

Okanogan project, Washington.—Okanogan, the California of the Northwest, sends us two good stories of orchard yields which hold first place to date. On the Breshears orchard, from 28 trees, 635 boxes of Delicious apples were picked, averaging 22.7 per tree. Boxes were well filled and gave 71 per cent, or 458 boxes, of packed apples, the average being 16.3. At this rate, the yield would be 912 packed boxes per acre, counting 56 trees.

Mr. W. M. Hudson delivered to the warehouse a wagonload of Delicious apples, 97 boxes, that ran from 48 apples to the box to 88 in size and graded out half and half extra fancy and fancy.

Yakima project, Washington.—H. W. Turner, one of the most successful Duroc-Jersey breeders in the valley, has annexed a nice string of ribbons this year. He has shown exhibits at Spokane, the State fair, Oregon State Fair, and at Puyallup. Mr. Turner has been raising pure-bred hogs for the last 12 years, but only for the last two years has he exhibited his stock.

E. C. Scott, county club agent; George Varnum, county live-stock project leader; and eight members of the Mabton Hercules Shorthorn Beef Club returned from the Western Royal live-stock show, Spokane, with prizes totaling \$187.50. Harold Holmes walked away with the contest, winning the first prize of \$30 for the best steers and production record, and also won a first prize of \$20 in the fat-steer open class show against stock entered from the State college and the University of Idaho.

A rainbow trout weighing 16 pounds dressed was caught recently in Strawberry Reservoir, Strawberry Valley project, Utah. The trout measured 32 inches in length and 19½ inches around the largest part of its body. Next!

PROJECT WOMEN AND THEIR INTERESTS.

By Mrs. Louella Littlepage.

THIS office has been so deluged with articles for the Women's Section that it is impossible to print them all in this issue, but don't let this deter you from keeping up the good work next month, and the next and the next. It is your section, and this is the best number you ever have received.

We do not want to take up any valuable space with personal suggestions, but with the holidays close upon us a plea for the old people surely is not amiss. Christmas has gradually evolved into a day devoted largely to making the little folks happy, but it need not detract from their pleasure to add some joy to grandmother's life.

A Home Economics Club, Yakima, Wash., recently devoted a meeting to the grandmothers of the community. The festivities started with a "rag-rug bee," in which the 40 grandmothers present showed the younger women how this work was done in their day. A luncheon served at small tables gay with autumn fruits and flowers followed. The songs and recitations by the grandmothers were among the most enjoyable numbers on the program of the afternoon. It was declared by the members to have been their most delightful and charming meeting, and a Christmas party with old songs, old recitations, and old customs revived would surely add much joy to old and young.

A Unique Experiment.

Plans are under way for the opening of a Home Talent Store in Montrose, Uncompahgre project, Colorado. In this store only the things made or grown in local homes will be handled. Realizing that a large number of talented women reside in the vicinity, Mrs. Edna Reisbeck conceived the idea of capitalizing these talents; not a scheme for personal gain, as Mrs. Reisbeck will be only a member like her neighbors. This is the plan in the rough:

The organization to be a sort of club whose members are desirous of earning a few dollars each week. No woman will need to neglect her home or her work, although many would be justified in hiring some of the unpleasant tasks performed while she devotes her time to work which she enjoys. There is no limit to the number of salable articles a woman can make or raise.

All grades of sewing, from the plainest of household needs to the most elaborate articles. This will include household linens, clothing, comforts, fancy work, knitting, crocheting, embroidery, etc.

The cooking-department opportunities are almost unlimited. Ranging from candies and bonbons down to good old baked beans, with a hundred and one good

things in between, even the cooking of special dishes for special occasions, this work will appeal to many.

House plants, birds, fish, poultry, and all kinds of fruits and vegetables will find sale.

Even the curing and canning of meats will find a place.

Also, a corner may be set apart for secondhand articles.

When sales are made a small per cent can be deducted for the maintenance of the store; the rest will be paid direct to the contributor. There will be no expenses for drummers or the middleman, but what profits there are will be for the women themselves. The only expenses will be for the store itself, and perhaps a clerk, but details have not yet been worked out for running the place.

A Women's Exchange.

Along much the same lines the club women of the Caldwell District, Bois project, Idaho, have been planning to open an exchange on November 18-19. The undertaking is fostered by clubs affiliated with the Burbank Federation, and each club has a representative on the board of directors. Before the opening day each club interested planned to meet and decide just what steps it will take to support the project. The Caldwell Commercial Club and city council have been asked to cooperate to a certain extent.

The exchange is to be located for the present in the rest room operated at Red Cross headquarters in Caldwell. On special sale days committees will be present to take charge of customers. On November 21 a cooked-food sale was scheduled to raise money for show cases and bulletin board. On the cases and on shelves will be displayed samples of things the women have for sale or exchange, and the bulletin board will list the things which can not readily be brought to the city. Sales will be made on a percentage basis.

This venture has been under consideration for 18 months, as many women of the district have expressed a desire for some sort of a clearing house, which it is believed this exchange will prove to be.

RECORD readers will be glad to learn more of this work.

Potato Day.

The project manager of the Minidoka project has forwarded an interesting description of a unique celebration held in Burley under the auspices of the Business and Professional Woman's Club, and a little booklet prepared to aid in developing the local con-

sumption of potatoes. The celebration included a large parade and a contest with several prizes for the best dishes made of potatoes. The crowd which was drawn to the town for the celebration was one of the biggest which has visited Burley for a long time. There is a "personality" about the little booklet which inspires one with the desire to try immediately each of its 200 recipes.

When a community program is put over in our town one can always count on the citizens of Burley and vicinity for their hearty cooperation, as was demonstrated on November 4, when the Business and Professional Woman's Club, assisted by the Chamber of Commerce, celebrated Potato Day. Invitations were sent to the neighboring towns and vicinities. The real Idaho spirit was shown by the large number of people attending. The program of the day was opened at 10.30 with a parade led by the Burley band, floats, cars, bicycles, and pedestrians representing the Idaho potato. Prizes were offered for the best floats, and keen competition was displayed by potato dealers, potato growers, merchants, clubs, lodges, and school organizations alike. The Y. W. C. A. took first and the high-school commercial club second for the best decorated floats. The first prize for the best feature float was awarded to the high-school agricultural class and the second to the Gem Meat Market. The Elks carried away first for the best feature, and James Henderson first for the best juvenile float. Virginia Kaar received first for the best decorated bicycle; Warren Thompson second. Frances Carr was chosen as the best caricature and Beatrice Hurtt as second.

The unique window displays added very materially to the day's entertainment, among which were represented the "Baker" family, the "Gem" family, and Mr. and Mrs. "Rural," by the Burley Grain & Produce Co., which was awarded first prize. The Corner News, with potatoes cooked in seven different ways, received second, and the Overland Meat Co. was given third for their miniature potato cave. Other windows deserving special mention were Swanson & Musser's reptile made of potatoes, and Wright's artistically decorated window was very attractive.

Immediately following the parade Mayor Griswold gave an address of welcome, after which C. C. Gignoux, assistant supervisor of the agricultural department of the Union Pacific, delivered a very interesting and instructive address on freight rates and the potato situation in Idaho. Among other things, he drew a comparison of the consumption of potatoes for 1921 and 1922 to date, which showed that notwithstanding the fact that potatoes are so much cheaper this year, there has been a decided falling off in the amount of potatoes consumed.

At noon over 3,000 people enjoyed potatoes cooked in many, many ways, tubs of potato salad furnished

by Miss E. J. Dowling, of the Corn Products Co., of New York, barrels of potato chips, hot potato buns, and coffee, to which were added barbecued beef donated by the Republican and Democratic county candidates, mutton donated by A. W. Rosecrans, and pork donated by Albert Ploeger, all served by the B. P. W. Club.

The sports in the afternoon consisted of a number of potato races, peeling contest, guessing contest, and a football game between the Burley High School and the Albion Normal School teams, resulting in a victory for the Albion team of 12 to 6.

A cash prize was awarded to Mrs. M. A. Savage for the best potato recipe for the club's cook book and demonstration of same. These demonstrations were tastily arranged in a tea room, from which were sold potato cakes, potato candy, etc. This potato cookbook, containing over 200 tried recipes, is to advertise Idaho potatoes and to promote the use of more potatoes everywhere, and can be had for the nominal sum of 10 cents from the Burley B. P. W. Club.

Pie Feast Aids Plan for Civic Improvement.

"Pie is pie, and all pie is good pie," was the agreement reached after a debate between Rev. G. A. Crowder and Mr. Meredith at the meeting of the Burleson Improvement League, Rio Grande project. The debate preceded the sale of pies and coffee for raising money to be used for civic betterment in the Burleson District. The meeting also decided that the pie made and donated by Mrs. H. E. Harris was the prize winner. It was a banana cream, and the recipe will be furnished anyone who will write to the editor of the Women's Department, RECLAMATION RECORD. Preceding the pie social the league approved a petition asking for additional street lighting, etc.

El Paso housewives, Rio Grande project, covered themselves with glory at the Home Products Show held in that city November 1-4. Prizes of \$10, \$15, and \$25 were offered for the best cakes made entirely of home products, with the exception of sugar. These were exhibited Thursday morning and auctioned off that same night, the proceeds to go to the Forum's Mile High Baby Camp.

Demonstrations at the 30 booths were given on Wednesday, while a Halloween party, vaudeville, and musicale closed the first day's program. On Friday retail merchants staged a Style Show, and on Friday night the hall was given over to the Boy Scouts. Saturday was children's day, when school work was shown and children participated in dances and other entertainment features.

Women Dedicate Trail Memorial.

Two miles east of Burley, Minidoka project, Idaho, where the Idaho Pacific Highway crosses the old Oregon Trail, the Woman's Club of Burley has erected an impressive memorial in honor of the pioneer

women who crossed the plains on the Old Oregon Trail. It is constructed of lava rock, with a 2-ton boulder on top. A bronze plaque on the east face of the monument bears this inscription: "Erected to the Pioneer Women and the Oregon Trail by the Citizens of Burley."

At the ninth biennial meeting of the Idaho State Federation of Women's Clubs, at Burley, October 18-19, with delegates from all the clubs present, the women dedicated the memorial with suitable ceremonies. The flags which veiled it were removed by Mrs. T. Winterburner and Mrs. Minnie Shodde, who were among the first pioneers to cross the desert on the Oregon Trail.

The mayor of Burley and several local club women gave addresses of welcome. At an evening session of the convention the opening number was a musical pantomime representing historical women. Folk dancing was also among the attractive numbers on the program.

Agriculture and Home Economics Courses.

It is reported that "in the interest of economy" certain project schools have cut agriculture and home economics from their curriculum. We confess to ignorance as to local conditions, but it seems strange

reasoning which takes from a child's education training in the vocation that in all probability will be his life work. As well train your boy for the ministry by teaching him to lay bricks or grow turnips, or give your daughter a course in stenography in order that she may earn her living by teaching music.

However, these are only isolated cases, and the change may be but temporary. In striking contrast is a report sent in from the Olathe High School, Uncompahgre project, Colorado.

There are 38 boys in the fine agricultural department in the Olathe school, and they enthusiastically proclaim their professor the best agricultural teacher in the United States. The boys assisted and cooperated in the fair exhibit, and won on their own exhibits about \$100 in premiums, taking 18 firsts, 15 seconds, and 7 thirds. Part of their exhibit was then sent to the State Fair. There are two classes, the advanced boys specializing in fruit growing and dairying, and the beginners in soils and crops, poultry, animal husbandry, and shop work. The boys will soon have their third annual fall lamb roast, which is always a big event. In the spring they celebrate with an egg bake, and in the summer take a week's camping trip. The city will have no lure for these boys.

Boys' and Girls' Club Work.

By H. A. Ireland, Agriculturist, Uncompahgre Project.

Boys' and girls' club work on the Uncompahgre project, Colorado, has received a lot of attention by those interested in the promotion of agriculture and home economics among the juniors, and has attracted a lot of attention among business and professional men as well as farmers and farm women by the results secured.

This year about 300 project boys and girls from 10 to 18 years of age voluntarily enrolled in various clubs, with the consent and approval of their parents. They were divided among pig clubs, sheep clubs, calf clubs, poultry clubs, sewing clubs, cooking clubs, canning clubs, corn clubs, and potato clubs. Local leaders assisted the various organizations in their communities, giving a great deal of their time and energy, and even going to considerable personal expense in their efforts to make the work both practical and profitable to the club members. Frequent meetings were held during the summer, the girls' clubs working on their projects, and the live-stock clubs studying care, feeding, and judging of live stock.

The fall fairs mark the close of the club year and no member is considered to have completed his project for the year who does not make an exhibit at his local fair. At the Western Slope Fair, Montrose,

there were 212 exhibitors from the various clubs, in addition to which a good number showed at the Delta County Fair. Both fairs were declared the best in their history, and at both the club exhibits made up a very appreciable part of the show. At Montrose, in the swine department, there were 135 head of swine shown, an even 100 being exhibited by members of pig clubs, and all but one of these 100 were pure-bred stock, that one being a fat barrow. Competitive demonstrations in sewing, canning, poultry feeding, and stock judging were held to select teams to compete in similar contests at the State Fair in Pueblo the last week in September. These teams were sent to Pueblo with county champions of the different clubs—19 individuals in all—with all expenses paid by voluntary subscriptions, being entertained while in Pueblo by the State Fair Commission in the Boys' and Girls' Club Camp in which there were 400 enrollments this year.

In the State contests Montrose team won first place in canning, second in sewing, third in poultry, and fourth in stock judging. The canning team, consisting of Lela Steel, 14 years of age, and Bernice Ross and Doris Metcalf, each 12 years of age, was awarded the State championship over all teams of whatever kind.

The favor in which boys' and girls' clubs are held on the Uncompahgre project is not due to mere sentiment. The clubs are helping to put over a big program, including the improvement of our crops and live stock and of our rural homes. The 1922 canning club champion has this year canned 1,200 jars of fruits, vegetables, and meat; the pig club champion grew a pure-bred Duroc-Jersey gilt from 60 pounds to 243 pounds, making an average daily gain of 1.56 pounds at a cost of 5 cents per pound, and he won over a number of others by a very small margin. An 11-year-old club boy owned, fitted, and showed the grand champion Poland-China boar of the show in competition with three experienced breeders—and the award was earned, not given by the judge through sentiment.

All of the club work is of a strictly practical nature, and we who have the privilege of devoting some of our time to it believe it returns large dividends on the investment.

The tenth annual hog and dairy show was recently held at Hermiston, Umatilla project, Oregon, and the exhibit of the boys and girls was an eye opener even there, where experience has taught the grown-ups to expect great things from the youngsters. Three boys

and girls won a free trip to the Pacific International Stock Show at Portland and others took various honors that were coveted by more mature growers.

The women of Artois, Orland project, California, recently held a bazaar which was a notable success. The event was planned to raise money to be devoted to a fund for the purchase of an athletic field, and a goodly sum was realized toward that end. It is reported that the Japanese garden and the refreshment booth were especially well patronized, everybody seeming to develop a special appetite for the occasion, while those seeking fun found it to their hearts' content in the fortune-telling booth, in the grab bag, the wishing well, and other attractions provided for the occasion.

The high-school girls, Orland project, California, have organized a flower club, and the agricultural teacher is giving them all necessary information and cooperation in the growing of flowers. Their plan is to improve the appearance of the school grounds by planting ornamental plants. They also expect to plant flowers around their own homes. This being the fall of the year, their first work will be the planting



1. UNCOMPAGHRE PROJECT CLUB BOYS ON STOCK JUDGING TRIP, ON FARM OF LOESCH BROS., MONTROSE, COLO., BREEDERS OF PURE BRED HOLSTEIN-FRIESIAN CATTLE.

2. STATE CHAMPIONS, LELA STEEL, 14 YEARS OF AGE, AND BERNICE ROSS AND DORIS METCALF, EACH 12 YEARS OF AGE, OF MONTROSE, AWARDED STATE CHAMPIONSHIP OVER ALL TEAMS OF WHATEVER KIND.

3. CLUB TEAMS AND CHAMPIONS, UNCOMPAGHRE PROJECT, COLO.

of sweet peas and bulb flowers. They hope to have quite an exhibit in the spring.

This is the kind of work that will lead to general beautification and incite civic pride, and it is a big step toward a condition that will make annual "clean-up" campaigns unnecessary.

The women of the Orland project were fortunate in securing a visit to Orland, October 27, from Miss Dodson, clothing specialist from the University of California, and the county home demonstration agent, who held a training class in guide-pattern work. Women representing seven farm-home departments were present. The meeting was very enthusiastic and instructive, the leaders cutting seven sets of guide patterns in order that they might take them back to their local centers and instruct the women in their communities. Each of the women had her own personal dress forms there and made the patterns on them.

A recent Newell paper, Belle Fourche project, South Dakota, devoted considerable space to the activities of the Woman's Civic League, whose work was briefly outlined in the October RECORD. During "Sale" week the chop-suey and dance suppers served by them netted about \$100. They have laid before the proper authorities a petition asking that the reservoir for storing city water be fenced as a protection to small children. The work that this league did during the past summer in cleaning up vacant lots, cutting weeds, removing rubbish, and the planting and care of flower boxes around street lights gave the city a trim, up-to-date appearance that aroused much favorable comment from visitors. Now that the season for such work is over it is proposed to continue along the lines of mental improvement, hence the departments—Parent-Teachers, for unity between home and school; Study Club, for consideration of current topics and methods of further civic progress; and music and art.

The league has made an enviable record.

The Grand Junction South Side Community Club. Grand Valley project, Colorado, has recently organized a Board of Control, looking to the beginning of plans for a community house and playground for that section. A suitable community house in that location they believe will solve the urgent need of a free kindergarten, a place for night classes in various lines, conducted on the Opportunity School plan, as well as many other social activities.

Their chief project, however, is the community store. All sorts of contributions—clothing, furniture, books, etc.—are donated by people of the section and sold at a very small price. During the three months ending October 1 the club purchased a 150-foot frontage adjoining the two blocks already owned by the

club, for which they paid \$1,400. The success of the store during the first year has far exceeded the estimation of its friends and justifies the necessity for wider interest and assistance in the consummation of their plans. There is a greater demand at this time for winter clothing than last year, as the uncertain market conditions make strict economy a necessity in many families. No clothing is given away except in cases of sickness or misfortune and when such gifts have been authorized by the Associated Charities.

A local paper states that the store is one of the finest institutions of a practical philanthropic nature ever started in that part of the State. The help this institution has been to hundreds of people in the city and county, the good it has accomplished, the comfort it has given, and the needs it has supplied, the paper states, are too great to estimate.

The town of North Platte, North Platte project, Nebraska, was hostess to the State Federation of Women's Clubs on October 24-26, entertaining over 300 club presidents and delegates, besides a score of visitors. It was a rousing meeting, and one of the largest ever held by the organization. The president of the Chamber of Commerce presented the convention a huge floral key on behalf of the city. The addresses included "The World and the Woman," "Nebraska's Greatest Asset," "Echoes from the Biennial," "What the Community Owes the Child," "The Adolescent Child," etc.

Washington Women Install Labor-Saving Devices.

A total of 463 home conveniences was purchased by members of testing circles recently conducted among rural women in the State of Washington under the supervision of Extension workers of the Department of Agriculture.

A testing circle is usually a group of about six women in a community who try out one article at a time in their homes and then pass it on in exchange for another piece of desirable equipment. Testing circles were formed in rural communities all over the State.

As a result of trying out labor-saving devices in their homes, 105 women bought pressure cookers for canning and cooking, 96 bought fireless cookers, 75 bought dish drainers, 70 selected utility tables, 60 wanted steam cookers, 24 purchased gasoline irons, 20 installed bread mixers, and 13 obtained vacuum cleaners.

It is interesting to note that the dish drainer apparently saved more time to each individual user than any other device except the pressure cooker, which it is estimated will save Washington housewives 32,445 hours of time annually. Moreover, a dish drainer saves energy as well as time, since the operation of wiping dishes is eliminated. This would not be true in case of a cooking device, because the

housewife would not necessarily have been active every minute while the food cooked. Each of the 75 women who bought a dish drainer expected to save 180 hours a year, or half an hour a day, by its use.

Proposed child-welfare work for Fallon, Newlands project, Nevada, through the activities of the Parent-Teachers' Association received impetus at the third district convention of the federated clubs of Nevada held in Reno in October. Child-welfare work was one of the many interesting and important matters taken up during the convention. Attention to the physical well-being of school pupils through examinations and corrective measures by nurses and physicians is one of the principal objects of the movement. Special attention will be given to children who are under weight. Fallon delegates arranged for an expert to meet with the Newlands women at a special meeting of the Parent-Teachers' Association.

The Church Memorial Art Exhibit will be displayed in Fallon in the near future at the request of the club women of the county. The exhibit is a large one. The reproductions are made from paintings of medieval and modern masters in the famous art galleries of Europe and America.

Twenty-three young people are now receiving the benefits of higher education from the students' loan fund to which Fallon clubs have subscribed.

Alfalfa Tea.

Why go to India or Ceylon or Japan for tea when alfalfa grows right at the back door? asks a cooking teacher in El Paso. Simply pour boiling water over young alfalfa, and there you are. If you are interested in reducing the cost of living or in boosting home-grown products, alfalfa tea is worth trying. Alfalfa also makes a tempting and nourishing salad. Use the tender sprouts with French dressing, or combine them with other vegetables.

Red pepper and chili tend to make persons irascible and hot tempered, said Mrs. Cronenwett, and frijoles, tortillos, and hot tamales do not make an acceptable diet. She has observed that women and girls are becoming more interested in cooking since they have found they can have clean kitchens, attractive stoves, and pretty house dresses.

She contends that most persons eat too much meat and that it is possible to have a well-balanced diet without it. It is known that the best athletes in the world come from Sweden, she says, where the people live on comparatively meager diets. Green vegetables are essential, and when possible they should be eaten raw. In any case they should not be cooked for hours in quantities of water which is drained off before they

are served. Minerals are the important properties of green vegetables, and they should not be cooked out or peeled away.

El Paso women will have an opportunity to obtain trained maids if they will cooperate with the vocational department of the public schools, according to the director of that department. The Smith-Hughes law, providing for salaries for teachers carrying on vocational work through the Nation, is responsible for this new service. A class for training housemaids has been organized in the El Paso schools, the course including household service, simple cooking, table service, care of children, cleaning, and laundry work. Housewives are asked to excuse their maids on Tuesday and Thursday afternoons in order that they may attend the school between 3.30 and 5.30. The placing of trained maids is another feature of the movement. Residents may at all times obtain maids for special occasions, such as the serving of luncheons or caring for children, by calling on the director.—L. L.

Honor Roll.

We plan to print from time to time in the RECLAMATION RECORD a so-called Honor Roll of water users, water-users' associations, and irrigation districts, made up of the names of those who seem particularly worthy of mention because of some outstanding feature in connection with the return to the Government of the amounts advanced for construction, thus permitting this money to be used over again in the construction of other farm homes. The following list, comprising the names recently brought to our attention, is undoubtedly incomplete and takes up a small amount of space. Additional space will gladly be allotted for this Roll of Honor. Let us hear from some of the others.

Mrs. Mattie P. Graves, Ysleta, Tex., Rio Grande project.—First landowner on the project to tender advance payment of construction charges. (See article in this issue.)

John R. Reece, Payson, Utah, Strawberry Valley project.—Construction charges paid in full.

Charles E. Snyder, Salem, Utah, Strawberry Valley project.—Construction charges paid in full.

Orland Unit Water Users' Association, Orland project.—All charges for project water users paid promptly and in full.

Mapleton Irrigation District, Strawberry Valley project.—All charges for project water users paid promptly and in full.

The sugar-beet growers on the Uncompahgre project have received their final payment of 18 cents in accordance with the sliding-scale contract in effect during 1921. This payment made a total of \$6.43 per ton that the growers received for beets.

MORE AMERICAN HOMES AND INCREASED PROSPERITY.

Consensus of Opinion of Bankers and Merchants as Developed by Correspondence and Conversation, 1922.

By F. H. Newell, Consulting Engineer, U. S. R. S.

"The success of the law [reclamation act] must be measured by the extent to which the reclaimed lands are utilized in the making of self-supporting American homes."—*Secretary Fall, June, 1922.*

1. The prosperity of the home, and of the West in general, is dependent upon the skilful use of the irrigated lands.

2. Water is the most valuable of the mineral resources when intelligently applied to fertile lands; properly tilled there result contented homes and a continuous supply of wealth in contact with the irregular and exhaustible supply of gold, copper, coal, and other minerals.

3. Water is now available for lands now irrigable to the extent of hundreds of thousands of acres which are not being used to their full extent.

4. Failure to properly use these lands is resulting in fewer homes and in the business of the West being deprived annually of tens of millions of dollars.

5. This annual loss in home making and in business is attributable to the fact that many of these irrigated lands are being held in tracts too large to be used effectively by the owners, financially unable to cultivate them, or who are unwilling to sell them at reasonable rates to men who could cultivate them.

6. Experience has shown that from 40 to 80 acres of irrigable land is as much as can be cultivated effectively by a single farm family of ordinary means and skill.

7. The possession of more than 80 acres of irrigable land by one family results in depriving other families of homes, and is preventing the community and business men from receiving the full benefit of the proper use of the irrigated land.

8. Such holding of areas of irrigable land in excess of the economic limit of 80 acres is often the result of unwise granting of credit by bankers and merchants. This indiscretion injures the creditor to an extent larger than the gain from the credit granted.

9. Under these conditions bankers and merchants may be considered as having a responsibility and a duty to the Nation, to the community, and to themselves not to extend credit in such way as to permit, directly or indirectly, the holding of irrigated land from full use, or of putting it to inferior use.

10. The business men, and particularly the bankers, have a duty to themselves, as well as to the country, to bring together, to study, and to act upon the information available as to how these irrigated lands may

be put to full use in making homes and in producing profitable crops.

11. Credit should be furnished or extended only when with full knowledge of these facts there has been an agreement or understanding between the creditor and the debtor covering a carefully written out system of farming, such as can be carried on throughout a series of years, such system having the approval of experienced farmers or agricultural experts thoroughly acquainted with all of the conditions.

12. The bankers and business men have a duty to promote the full use of the land already provided with water by aiding in locating experienced farmers, who can purchase the lands in 40 to 60 acre tracts.

13. For this purpose the bankers, merchants, or others furnishing credit to the owners of irrigated lands should endeavor to perfect an organization to secure long-term options at low rates on irrigable lands, so that when widely advertised with fixed prices these lands may be available for prospective homeseekers.

14. The prices as announced must be sufficiently low to attract desirable purchasers. Good irrigated land, with paid-up water rights, should be had on easy and attractive terms, the terms of payment being as important as the price.

15. Western arid land without water has little value. It is often a liability. The options for the raw desirable lands for which water is available or will soon be ready should be had at the rate of, say, \$15 to \$25 per acre and higher with improvements.

16. Each person permitted to exercise an option on such lands should be a man with family, and carefully "hand picked" with reference to ability and willingness to work, and held to not more than 40 or 80 acres to the farm.

17. As these farmers are securing permanent homes and will become neighbors and patrons of the business men of the town, every effort should be made to see that they are well advised and protected in the selection and purchase of homes and in the layout of the farm.

18. Tenantry should be discouraged in extending credit. The good tenant should be aided to become a home owner and permanent citizen, his interests being thus reversed from that of "mining the soil" to that of preserving and increasing its fertility.

19. Irrigated farming being a highly specialized industry, requiring the full time and attention of the

farm owner, every reasonable effort should be made to discourage men who are securing credit from attempting to conduct two businesses—that is to say, credit should not be advanced to professional men,

lawyers, doctors, clerks, stenographers, nor shopkeepers to enable them to try to operate an irrigated farm in connection with another business. "No man can serve two masters."

DRAIN CLEANING, RIO GRANDE PROJECT.

By F. E. Wilson, Assistant Engineer.

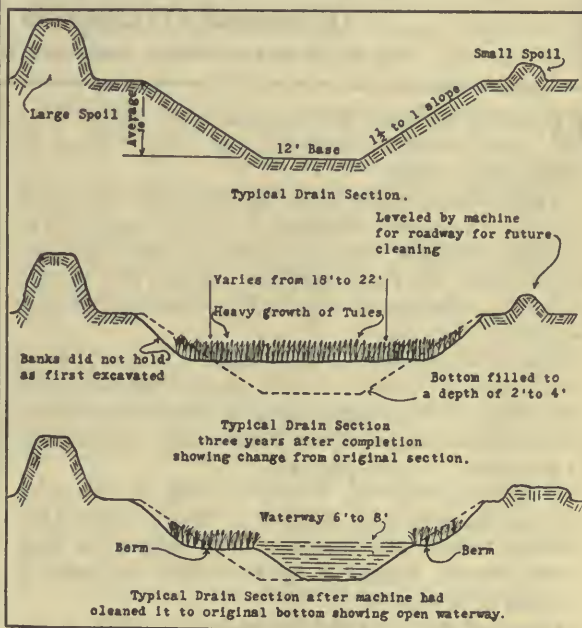
CONSTRUCTION of open drains on the Rio Grande project, begun in 1917, has brought relief from seepage and afforded protection to some 102,500 acres of land. A portion of these lands had become so water-logged as to be useless for any purpose, but is now possible of cultivation and capable of producing paying crops. Not only the seeped areas but the other lands of the 150,000 acres of the project will enjoy the benefits offered by the total of 350 miles of drains which will be completed about October, 1924, if present rate of progress is continued.

Excavation of drains was carried to a depth of 10 feet to lower the water table of the surrounding lands, providing protection for the deepest-rooted plants. The growth of tules, which is a constant menace, filling the full section of the drain, choking the water channel, and retarding the flow, has been cut from time to time. Recently it was discovered on the Rio Grande project that the presence of water cress prevented the tule growth in the water channel, and experiments are now being carried on to determine whether or not it would be feasible to plant the water cress in drains in order to kill the tules.

Cleaning the drains of weeds and tules and other obstructions has constituted the maintenance work previous to the present year. However, accumulation of silt, aided by the presence of tules, had so raised the grade in the Mesa Drain in the El Paso Valley that further and much more extensive cleaning methods became imperative. It was desired to effect the cleaning by cutting a small waterway in the present drain and at the same time to preserve the settled banks. Three classes of drag lines were tried—a Bucyrus 30-B equipped with a 1-yard bucket, a Class 9½ Bucyrus drag line with a 1½-yard bucket, and a small Pawling and Harnischfeger machine equipped with a half-yard bucket.

In all cases it was attempted to cut only a 6 or 8 foot bottom, but neither the 9½ nor the 30-B Bucyrus machines could accomplish the required results. They constantly widened the section, not only on account of the size of the bucket, but because it was not possible to lift from the ditch a full bucket without dragging it against the bank in order to hold the wet material. With these large machines it was necessary to take out all growth from the bottom of the drain and from the bank on the operating side.

This, of course, steepened the slope and, having removed the protecting growth, made that side liable to cave in, causing continual widening of the drain which in the course of several years of cleaning would materially matter in the amount of right of way taken for its construction. The amount of excavation, greater than necessary to accommodate the flow of water in the drain, and the high cost, which in the operation of these machines amounted to approximately \$632 per mile for the Class 9½ and \$520 for the 30-B Bucyrus, prohibited their use.



The Pawling and Harnischfeger drag-line excavator, sufficiently counterbalanced, equipped with a half-yard bucket and a 37-foot boom, was put in operation, confining the excavation of weed growth and earth to a width of from 6 to 7 feet. This machine, with the small bucket and the shortened trip line, was able to lift the load without removing the bottom growth on the operating side, and without pulling the bucket against the old settled bank. A clean, neat piece of work was accomplished, giving a clear channel from 6 to 8 feet in width, practically to grade

and free from tule growth, lowering the water surface from $1\frac{1}{2}$ to $2\frac{1}{2}$ feet.

The cost of doing the work with this smaller machine was less for several reasons: Its low operation cost as compared with the cost of the larger machines; the possibility of accomplishing results with the smallest amount of yardage required to provide adequate capacity, due to digging the lesser width through the center of the drain; the speed with which the smaller machine can make the trips in and out of the drain; and the lesser amount of time consumed in making a road ahead of a smaller machine.

The $9\frac{1}{2}$ miles of drain were cleaned at a total cost of \$3,148.62, or approximately \$330 per mile; 40,875 cubic yards of material were removed at a unit cost of 8 cents. The machine movement averaged 600 feet a day. In addition to the yardage removed, about 8,000 yards were handled in the construction of a roadway for the machine and repairing of breaks, caused by irrigation water flowing in the drain from

adjoining fields. This roadway can, of course, be used in future cleaning.

Cleaning drains, both up and down grade, was tried in the El Paso Valley, and experience developed the fact that digging down grade is most successful. It was first thought that while digging down grade, especially through heavy cuts, bottom material would run back between shifts and raise the grade of the portion of the drain already cleaned. This, however, did not occur, even when the machine was down for a full day. While digging up grade, owing to rapid lowering of the grade, much material was washed below, raising the grade of the portion of the drain cleaned; and in several instances when stopping the machine for repairs it was necessary to place a sheet-pile cut-off across the drain to prevent filling of the cleaned portion.

The Mesa Drain was the first of the Rio Grande drainage system to be cleaned, and, although it will be necessary to perform similar work on other drains, such work will not be repeated on the Mesa for several years.

INCREASED APPLICATION FOR THE VENTURI FLUME.

By H. Kenneth Smith, Assistant Engineer, Milk River Project, Mont.

DURING the past few years several papers have been published regarding the Venturi flume as a measuring device.

A preliminary investigation of this device was made by V. M. Cone and published in the Journal of Agricultural Research, Volume IX, No. 4, April 23, 1917. In this paper Mr. Cone suggested a design that seemed to him comparatively satisfactory, considering both reliability and cost.

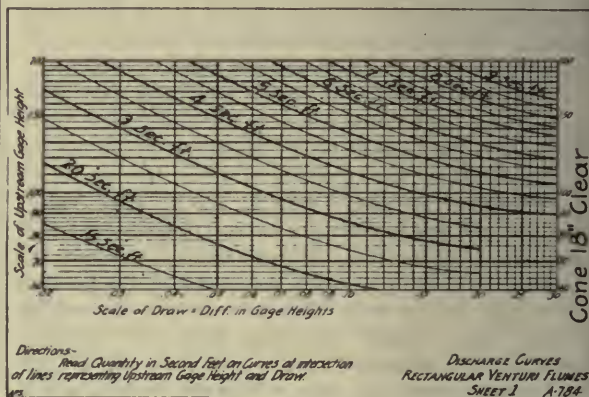
Messrs. Wilson and Wright made a series of tests of the Venturi flume at the hydraulic laboratory of the College of Civil Engineering of Cornell University, which were discussed in the Engineering News-Record of September 2, 1920, page 452.

In Bulletin No. 265, February, 1921, of the Agricultural Experimental Station of the Colorado Agricultural College are published more exhaustive tests of the design suggested by Mr. Cone, in which a formula is developed.

In all of the foregoing papers the capacity of the flume is limited in that the accuracy of measurement of a small discharge at a high-gage height is doubtful.

On the Milk River project of the United States Reclamation Service, headquarters at Malta, Mont., a large number of Venturi flumes have been installed for the measurement of farm deliveries and, in some cases, lateral deliveries. Gage heights are measured with a hook gage from nails driven in the sides of the gage walls. The hook gages are made from

strap iron one-eighth by one inch, graduated by hundredths to 2 feet. Each ditch rider carries one of these hook gages as a part of his regular equipment and uses it as a 2-foot rule for various purposes.



The discharge is determined from a semilogarithmic chart, with upper gage heights and draw, or difference in gage heights, as coordinates, the discharge in second-feet being read on curves. The sheets are drawn of a size to fit the standard time-book cover of the Reclamation Service, a sample sheet being illustrated in the accompanying diagram.

Operating conditions on an irrigation project often require that a small quantity of water be delivered through a ditch of considerably greater capacity, and

at the same time it is required that the water be backed up until the ditch is practically bank full.

Generally it is not practical to instruct a ditch rider to read gage heights to a refinement greater than one-hundredth of a foot, and an error of one-hundredth is quite common. The problem, then, is so to construct or modify the Venturi flume that an error of one-hundredth in gage reading would not be material when delivering water to the farmers.

This difficulty is overcome by installing a plug in the throat of the flume, thereby reducing the water area. This plug consists of two weir boards bolted together, the sharp edges of both boards being toward the throat. A bolt with a thumb nut holds them in place.

The accompanying illustration shows the testing channel where the discharges through the plugged flume were compared with the discharge over a standard weir. The plug is shown on the bank in the center of the picture.



Testing channel with V-notch and rectangular flumes.

These plugs can be placed in the flume or withdrawn while the ditch is in operation. Care must be used that the plug is snug against the bottom of the flume and so tight that it will not float or otherwise become dislodged.

By means of this plug a flow that in the standard design will cause a draw of one or two hundredths will now cause a draw of ten to twelve hundredths and is therefore a measurable quantity. An error of one-hundredths in reading at ten or twelve hundredths is of much less moment than the same error at one or two hundredths.

Four sizes of the Venturi flumes are in use on the Milk River project, having throat widths of 12, 18,

24, and 30 inches. For the 12 and 18-inch sizes the height of the plug used is 9 inches, and for the two larger sizes the height is 15 inches.

These plugs have proven quite satisfactory and have greatly increased the accuracy of the measurement of water on this project.

Oregon-California Farms Open to Entry.

The attention of ex-service men of the World War is called to the opportunity awaiting over 100 of them to secure a Government farm unit in the Tule Lake Division of the Klamath Irrigation project, situated in California and Oregon. Until January 27, 1923, these remaining units may be filed upon by ex-service men of the World War, after which time they will be open to filing by any qualified citizen of the United States.

The farm units lie in the former bed of Tule Lake. The level of the lake has been lowered, as a result of which these fertile lands are exposed and in excellent condition for cultivation. Similar Tule Lake bed land, opened to entry in 1917, has produced excellent crops of wheat, rye, oats, and alfalfa. By applying now the successful applicants will be able to get their farm units in proper condition for next season's crops.

The farm units have irrigable areas ranging from 13 to 80 acres each; the average is 55 acres. The lands are comparatively smooth, free from brush, trees, and stones, and the fertile soil is of sedimentary character, composed of sand and silt.

The Government water right costs \$90 per irrigable acre, but at the time of making water-right application a deposit of 5 per cent of the cost, or \$4.50 per irrigable acre, is required. The settler has no further payments to make on this cost for 5 years, after which the balance is paid in small installments extending over a period of 15 years, without interest. There is an annual operation and maintenance charge as on all the irrigation projects.

In order to comply with the homestead regulations successful applicants for these farm units must complete their filing *in person*, either before a United States commissioner in the vicinity of the land or at the local land office at Lakeview, Oreg., or Sacramento, Calif., depending upon the State in which the farm unit is located.

For additional information, ex-service men (and after the middle of January, 1923, civilians) interested in this opportunity to secure a farm home should write to the Project Manager, U. S. Reclamation Service, Klamath Falls, Oreg.

The Klamath project reports that a rainbow trout measuring 36 inches in length and weighing 23½ pounds was caught in the Upper Klamath Lake last summer. Next!

RECLAMATION LAW NOTES.

By the Chief Counsel.

Collection of Drainage Costs as Operation and Maintenance.

ON August 22, 1922, in the case of Nampa & Meridian Irrigation District against J. B. Bond, in the United States District Court for the District of Idaho, Judge Frank S. Dietrich handed down a decision (283 Fed. 569) sustaining the right of the United States to collect in advance from the plaintiff district certain drainage costs of the Boise project through an operation and maintenance charge. The full text of the decision follows:

In accordance with the expressed desire of the parties, the averments of the complaint are given a liberal construction to the end that the merits of the controversy may be adjudged upon the motion to dismiss without the necessity of a trial more fully to disclose the particular facts.

1. Our discussion may be clarified by having at the outside a just understanding of the plaintiff's relation to the subject matter of the suit. Whatever may be its formal, legal status under its contract with the Government, it is not the real party in interest. In practical effect it is but an intermediary, an agency, resorted to by the real parties in interest for convenience in the distribution of water and the collection of charges on account thereof. Back of it, as the real plaintiffs, are the project lands within its borders; they are the sole beneficiaries.

2. Originally these lands had precisely the same status as all other lands on the project.

3. This status was not materially altered by the contract between the district and the Government. The contract concerns procedure, and relates to form rather than substance. It clearly discloses the intent of the parties thereto that in effect all project lands, both within and without the district, were to continue to be upon the same footing, sharing ratably in the benefits and burdens of the irrigation system.

4. While the facts are not expressly pleaded, it does appear in the record of the case, the decree in which plaintiff pleads and exhibits as a part of the complaint, and in the public reports of the Reclamation Service, that the cost of the drainage facilities constructed in the plaintiff district under the terms of the contract exhibited in the complaint (other than the part thereof allocated to old water-right lands) was charged not to the plaintiff lands alone, although they were the only lands protected thereby, but ratably to all the lands in the project. It is a further known fact that of the other project lands some are on the system above the plaintiff lands and others are below; and most of these lands could receive no benefit at all from such drainage facilities and the others could be only slightly or indirectly benefited.

5. In fairness and equity, then, what can be said in defense of the position for which the plaintiff lands now contend? During the earlier part of the operation of the system, when they were threatened with destruction or injury from the rising ground water, they sought and were given protection by the construction of a drainage system, the cost of which

was included in the general construction charge, and as such was, of course, ratably apportioned to all the lands in the project. Now when as a result of the further operation of the system, for their use and benefit, as well as for the balance of the project, other lands are menaced in the same way and from the same source, they seek to shift the entire burden of similar protective measures to the lands to be directly benefited. When they were threatened they did not, as now, invoke the doctrine of assessment of benefits; at least no such doctrine was recognized or applied in distributing the cost of the drainage facilities created for their protection.

6. Though there is no equity in the position, we are asked to sustain it because of certain considerations of technical law. In substance, as I understand it, the reasoning is that the plaintiff lands are in an irrigation district, that the charges must be collected by assessments under the State law, and that before such assessments can be made there must be an apportionment of benefits, and that the plaintiff lands are in no need of further drainage facilities and hence no benefits can be apportioned. But in so reasoning sight is lost of a fundamental characteristic of all irrigation systems constructed under either the State or the Federal laws. Such a project is an indivisible unit, the burden of constructing and maintaining which is apportioned ratably to all lands receiving water therefrom. A water user can not divide a system into its component parts and decline to pay his share of the cost of constructing or maintaining, or of operating, those portions from which he receives no direct benefit. If a wasteway at the lower end of a system or a drainage ditch is essential to the lawful and efficient maintenance and operation of the system, it is properly to be regarded as a part of the system, and a water user near the head can no more consistently decline to pay his ratable share for its construction and maintenance than he could decline to pay for the lower portion of the main canal or for laterals that do not serve his lands. When the drainage ditches within the plaintiff district were constructed for the plaintiff lands, they were correctly treated as a part of the irrigation system, and quite as correctly their cost was distributed ratably to all the lands without consideration of the question of direct benefit. It follows that by the apportionment already made in the district of the benefits of the system as a whole, pursuant to the State statutes, the basis of distributing cost has been fixed once for all—not the cost of constructing or maintaining any single unit but the entire system, including every feature thereof, whether primary or auxiliary. It is the apportionment of the burden of constructing the entire project in accordance with the benefits received by the several tracts of land from the project as a whole.

7. There is the further contention that this is not a proper charge for "operation and maintenance." These terms are found both in the reclamation act, as amended, and the contract between the plaintiff district and the United States. They are of elastic and often indefinite import. In systems of accounting, especially of public-service corporations, what should be entered as capital or construction and what as operation and maintenance is not infrequently a question of great difficulty and is sometimes susceptible

of only an arbitrary answer. If in strictness we undertake to apply the narrow view advanced by the plaintiff that the maintenance of an irrigation system is accomplished by "merely maintaining the status quo" of the physical plant, we are soon driven to absurdities. If a wooden headgate rots out we could not replace it with one of concrete, though satisfied that in the long run it would be economy so to do. If there turns out to be excessive seepage in a section of the canal it can not be prevented by puddling or otherwise treating the canal to prevent waste, for that would be to change the status quo. If there is a break in the earth bank of the main canal on a side hill, however great the danger of a repetition of the break and however prudent it would be to reinforce the earth with a concrete lining, thus insuring against future disaster, such a course would be to alter the status quo, and therefore could not be followed without putting into motion the complicated machinery required for raising money for new construction work. But illustrations without number of the inadequacy and impracticability of such a view will readily occur to anyone who has observed the operation of a large irrigation system, either at close range or from a distance. The Government has fixed the construction charge upon this system under the law, and it can not now add to it without the consent of a majority of all of the water users. If, in the management of this great system, with its hundreds of miles of canals, its dams and gates, and a multitude of devices for diverting, impounding, carrying, and distributing water, it can not in an intelligent way provide for new conditions or in the light of experience make new and better provision for old conditions by charging the reasonable expense thereof to maintenance and operation, the value and efficiency of the system would be greatly impaired. Surely such a result could not have been intended by Congress or by the parties to the contract here involved. The terms "maintenance and operation" must have been used in a broader sense—a meaning perhaps not susceptible to precise and comprehensive definition but none the less well understood.

True, the expenditure under consideration is relatively large, but it is to be borne in mind that it is to meet a condition which has gradually grown up as a result of the continued operation of the system. If each year there had been a collection and expenditure of an amount commensurate with the result of that year's operation, the case would present a different aspect, but would involve the same principle. By express admission the condition to be overcome is the direct result of operation, and is an incident thereof, and if the project is to be "maintained" the expenditure must be made. If in the course of operation the management incurred a liability for injury to land by flooding or for destruction of crops, undoubtedly the expense of discharging such a liability would be borne as an operating expense. May it not take the less expensive course of providing safeguards against such flooding and charge the expense thereof to maintenance and operation? With knowledge that the operation of the system without drainage facilities will inevitably swamp large areas of land, rendering the same worthless and destroying the crops and trees growing thereon, must the plaintiff stand by until confronted with claims for damage?

Plaintiff frankly concedes that the condition against which the Government seeks to provide is a direct result of operating its irrigating system. It also concedes that while ground water is always a possible if not a probable contingency, drainage facilities to

take care of it can not safely be provided in advance, for there can be no intelligent prognosis of just where such waters will rise and do or threaten injury. If, however, the cost of such facilities is chargeable only to construction, the Government is in this dilemma: Until it has completed its irrigation system and sold water rights and has delivered water to supply them, it can not include such cost in the cost of construction, for there are no possible data upon which to base an intelligent estimate of the amounts. But it must fix the "construction charge" before it can sell water rights. Hence, such charge can not be included in the construction cost, as declared in the Public Notice, and the amount fixed in the Public Notice can not thereafter be increased without the consent of a majority of the water users. Whether such consent would ever be given, even in a case of the most urgent need, if such need is not general but only local, as is likely always to be true, is a question that may be referred for answer to the attitude of the plaintiff lands in the instant suit.

It is not thought that Congress could have intended that the terms operation and maintenance would be construed so strictly as thus to render the Reclamation Service impotent to protect the Government investment and the interests of the settlers. A reclamation project is for the reclamation and not the destruction of lands, and it is expected that the reclaimed lands will return the investment and maintain the project as a going and fruitful concern. Here is an operation result highly injurious to the project. If the proposed protective measures are not taken, admittedly a large area of the project lands will be rendered worthless. If they are thus made worthless, they will not only be incapable of returning to the Government their ratable and apportioned part of the construction cost, but they will also necessarily fail to carry any part of current maintenance and operation, and thus will be shifted their proper burden to the remaining lands on the project, including the plaintiff lands. But this is not all. If in principle the plaintiff's contention is right, it is equally applicable to a case where the ground water rises uniformly over the entire project and threatens the deconstruction of all the lands at the same time. In such a case the project as a whole can not be "maintained," but is to be destroyed as a result of "operation," because an admittedly sensible expenditure, by which such self-destruction can be avoided, may not be charged as an expense of either operation or maintenance. In other words, the cost of self-preservation from an ordinary and necessary incident of operation is not chargeable to either maintenance or operation. To state the proposition is to reject it.

8. Finally it is suggested that until recently it has been customary with the Reclamation Service to carry drainage as a part of construction. I do not stop to inquire touching the correctness of the statement. The facts are not expressly pleaded; and if, so far as concerns this project, we go to the sources from which the facts are to be gotten, we find that at the time the drainage expenditures covered by the plaintiff's contract were made the service also included in "construction" cost what are admittedly expenses of operation and maintenance. That is to say, during the long period prior to the giving of formal public notice the partially completed system was operated, and in the course of such operation large expenses were incurred over and above the rentals and other income for the same period, and this balance was covered into and charged against construction cost.

It follows that a like disposition of the drainage expenditure has little interpretative significance.

It being thought that the proposed method of providing protective means, admitted to be necessary, against a menace, conceded to be the direct result of operating the system, is fair and equitable, and contravenes no statutory or contractual right, the motion to dismiss will be allowed.

Part of California Irrigation District Act Held Unconstitutional.

The Supreme Court of the State of California, in *Miller & Lux v. Board of Supervisors of Madera County et al.* (208 P. 304), holds as follows regarding the constitutionality of the California irrigation district act:

California irrigation district act, section 4, as amended by Statute 1911 (ex. sess.), page 139, in giving conclusive validity to the order of the board of supervisors as to formation of a proposed district and depriving a landowner therein of the right to contest the question of whether his land would be benefited would violate the due process clauses of the Federal and State constitutions, unless opportunity for inquiry into the question of benefits is given elsewhere, notwithstanding section 69, which permits contest of the validity of an assessment, but not inquiry into that question.

California irrigation district law, section 4, as amended by Statute 1911 (ex. sess.), page 139, providing that a finding of the board of supervisors in

favor of the genuineness and sufficiency of the petition and notice shall be final and conclusive against all persons except the State upon suit commenced by the attorney general, is unconstitutional in so far as it deprives the superior court of jurisdiction to review the proceedings of such board, since constitution, article 6, section 5, vests jurisdiction in the superior court in certiorari.

California irrigation district law, section 72, as amended by Statute 1915, page 1370, section 8, in so far as it attempts to make the findings of the board of supervisors upon a hearing as to benefits to be derived from a proposed irrigation district conclusive, so as to prohibit inquiry upon direct attack in certiorari into the question of whether or not the supervisors afforded due process of law in exercising their jurisdiction, denies due process of law, which requires a hearing upon the question of benefits and evidence upon that subject.

Payment by Government of State Tax on Gasoline.

The Federal Government can not be required to pay the tax, as such, assessed by the State of Maryland on the sale of gasoline, but if a dealer in the State in fixing the price of the gasoline to the Government included therein an amount sufficient to cover the tax, no objection to the payment of the price thus fixed can be made upon the ground that a tax was taken into consideration by the dealer in fixing it, the question of how the price was arrived at being immaterial. (2 Dec. Compt. Gen. 81.)

—Ottamar Hamelc.

THE RECLAMATION MAIL BAG.

Irrigation District vs. Water Users' Association.

In connection with the proposed contract between the United States and the water users of the Belle Fourche project, South Dakota, First Assistant Secretary Finney has sent identical letters to Hon. Thomas Sterling, United States Senator, and to Hon. William Williamson, Member of the House of Representatives. A copy of the letter addressed to Senator Sterling follows:

DEPARTMENT OF THE INTERIOR,
WASHINGTON, October 26, 1922.

Hon. THOMAS STERLING, *United States Senate.*

MY DEAR SENATOR: I have your letter of October 20, 1922, referring to a letter addressed to the Secretary October 14, 1922, by Mr. W. D. Buchholz and four other residents of Newell, S. Dak., regarding the proposed contract between the United States and the water users of the Belle Fourche Federal irrigation project in South Dakota.

Mr. Buchholz writes that many of the members of the Belle Fourche Valley Water Users' Association are opposed to the formation of an irrigation district, preferring to have the proposed contract made with the existing water users' association, and requests an explanation as to why the proposed contract should not be made with the association.

While the Congress has not made a mandatory direction in favor of contracts with irrigation districts rather than with water users' associations, it

has shown a preference for the former in much legislation.

In the Smith Act of August 11, 1916 (39 Stat. 506), public lands of the United States are made subject to the assessment and levy of irrigation districts. The sundry civil appropriation act of June 12, 1917 (40 Stat. 148), provides that no moneys shall be expended for drainage on the Rio Grande project except in irrigation districts formed under State laws and upon the execution of agreements for the repayment to the United States of all project investments. A similar provision appears in the sundry civil appropriation act of July 1, 1918 (40 Stat. 674), and in the sundry civil appropriation act of July 19, 1919 (41 Stat. 200). In the act of July 1, 1918, Congress specifically approves an agreement by which a developed Carey Act project in Idaho, which had been organized into an irrigation district known as the King Hill irrigation district, contracted with the United States for the further development of the project and for repayment to the United States under the irrigation district plan.

The sundry civil appropriation act of June 5, 1920 (41 Stat. 913), approves a further agreement with the King Hill irrigation district and also provides that no part of the appropriation made for the Boise Federal irrigation project in Idaho shall be expended for drainage except in irrigation districts formed under State laws and upon the execution of agreements for the repayment to the United States of the cost thereof. The act of May 15, 1922 (Pub. 219).

is intended to encourage the making of contracts between the Government and irrigation districts under Federal irrigation projects.

The experience of the Reclamation Service shows that contracts with irrigation districts are more satisfactory than contracts with water-users' associations, both from the standpoint of the Government and from the standpoint of the water users. Among the reasons why an irrigation-district organization is preferable to a water-users' association may be mentioned the following:

(1) The organization, financing, and operation of irrigation districts are fully under popular control.

(2) All lands benefited are bound to pay their proper share of the costs of the irrigation system, and a small minority of landowners can not impede the development.

(3) All lands benefited become obligated at once, insuring a greater productiveness in crops and an earlier return of the cost.

(4) The irrigation district encourages all land to be put into cultivation to meet assessments, and so retards speculation.

(5) It simplifies the machinery for the collection of moneys due the United States.

(6) It is the most efficient organization of which we know, and affords the best security to guarantee the return of the cost of an irrigation project to the United States, and all in all it best meets the demands of the national irrigation law that the estimated cost of Federal irrigation works shall be repaid.

In this connection it is a pertinent fact that the life of the present Belle Fourche Valley Water Users' Association will by the terms of its incorporation expire in July, 1924.

You will be interested in knowing that a mass meeting of the water users of the Belle Fourche project, held on October 7, 1922, resulted in approval by a vote of four to one of the proposed contract and of the organization of an irrigation district.

Respectfully,

E. C. FINNEY,
Acting Secretary.

Shoshone Project Interested in Rumanian Milking Sheep.

Some time ago Mr. Harry Hecht, a water user on the Shoshone project, conceived the idea of importing to the project 200 milking sheep from Rumania in the belief that they would prove a valuable addition to the project's source of revenue. On taking the matter up with the Department of Agriculture Mr. Hecht learned that the quarantine regulations would prevent him from bringing these sheep directly into the country from Rumania. Recently, however, Mr. Hecht was advised by the Department of Agriculture that he might import the sheep to Cuba, and if they were found free from disease at the expiration of 60 days he could then import them to the United States.

It is understood that a number of water users on the Shoshone project are interested in Mr. Hecht's plan, and in view of the possible interest of water users on other projects Mr. Hecht has prepared the

following statement concerning these sheep and his belief in the desirability of their addition to the live stock of the project:

The milking sheep has been known in some countries of Europe for centuries. They have been bred up for cheese production in France, Italy, Rumania, Hungary, Russia, etc. The Rumanian sheep are of the Karakul type. Most of the lambs are killed when 2 to 9 days old for their fur. These skins are known in the United States as Astrakhan or Persian lamb skins. The lambs classed unfit for fur are left with the ewe for 5 to 6 weeks, when they are taken away to a good pasture and the ewe put to milk.

The sheep are milked 6 months of the year during the summer months only, during which period they are taken out on the range, where a camp is put up for milking and making the cheese. Around 1,000 head of sheep are cared for at one camp. A bunch of pigs are taken along to consume the skimmed milk. One milker is hired for each 80 sheep. They are milked three times each day, and the cheese is made from the fresh milk three times each day. One cheese maker is sufficient for 1,000 sheep. The cheese is taken from the camps once or twice a week to the cities and sold to the stores. The fresh cheese is considered the best; therefore the natives will not buy cured cheese so long as they can get fresh cheese. The fresh cheese will keep about four weeks, when it has to be salted and cured in cans. The cured cheese is imported to the United States under the name of Roquefort cheese and sells for \$1 to \$1.50 per pound.

The sheep average 40 pounds of cheese per head for the season. They will shear not less than 6 pounds of wool per head; the wool sells for not less than 50 cents per pound in the United States. These sheep, after the milking season is over, are brought back to the farms for the winter, where sheds are provided for shelter in stormy weather and the animals are fed hay all winter.

The principal crop in the Shoshone project is alfalfa hay. The milking sheep will pay \$40 a ton for hay. The hay fed on the farms to the milking sheep will build up the soil in which sugar beets can be raised successfully, for which we have a local market. The milking sheep will be out on the mountain range during the summer when the farmers are busy irrigating and where they have splendid feed and good water.

Those who are interested further in this subject might care to turn to the RECLAMATION RECORD for October, 1917, page 484, which contains an article by Dr. C. C. Young, of Belen, Tex., on Karakul sheep, the type of the Rumanian milking sheep.

Recent Service Orders.

CIRCULAR LETTERS.

No.

1165. Lease of Government land.

1166. Collection of delinquent accounts.

1167. Circular letters and general orders; key words.

1168. Repayment of construction charges in advance by Mrs. Nattie P. Graves, of the Rio Grande project.

ADMINISTRATIVE AND STATISTICAL PROGRESS REPORTS FOR OCTOBER, 1922.

Monthly conditions of principal Reclamation Service reservoirs for October, 1922.

[Elevation above sea level.]

State and project.	Reservoir.	Available capacity in acre-feet.	Elevation.		Storage in acre-feet.			Out-flow in acre-feet.	Elevation of water surface.		
			Spill-way crest. ¹	Lowest gate sill. ²	Beginning of month.	End of month.	Maximum.		Beginning of month.	End of month.	Maximum.
Arizona, Salt River.....	Roosevelt ³	41,305,000	2128.1	1924.6	566,737	516,002	566,737	50,735	2069.25	2064.26	2069.25
California, Orland.....	East Park.....	51,000	1199.68	1111.68	2,770	1,078	2,770	1,700	1149.21	1141	1149.21
Idaho:											
Boise.....	Arrowrock.....	280,000	3211	2956	.....	10,400	10,400	35,800	2956	3032.4	3032.4
	Deer Flat.....	177,000	2518	2488	11,500	9,000	11,500	5,880	2492.6	2491.7	2492.6
Minidoka.....	Lake Wolcott.....	95,180	4245	4236	43,240	88,900	89,010	86,129	4240.31	4244.46	4244.47
	Jackson Lake.....	847,000	6769	6728	255,650	265,600	265,600	8,760	6743.62	6744.1	6744.1
Montana:											
Milk River.....	Nelson.....	70,000	2223	2200	29,000	29,900	30,000	3,250	2213.28	2213.48	2213.5
St. Mary storage.....	Sherburne.....	66,000	4788	4720	.....	.....	.....	.....	.....	.....	.....
Sun River.....	Willow Creek.....	16,700	4130	4085	11,922	11,847	11,922	.....	4125	4124.9	4125
Nebraska-Wyoming, North Platte.....	Pathfinder.....	1,070,000	5852	5670	304,020	249,300	304,020	70,543	5797.87	5790.75	5797.87
	Lake Alice.....	11,400	4182	4159	4,018	8,224	8,224	.....	4170.4	4177.6	4177.6
	Lake Minatare.....	60,760	4125	4074	7,750	40,824	40,824	.....	4089.3	4115	4115
Nevada, Newlands.....	Lake Tahoe.....	120,000	6230	6224	.....	.....	.....	23,380	6225.99	6225.45	6225.99
	Lahontan.....	273,600	4162	4060	163,720	164,330	164,330	12,374	4148.2	4148.3	4148.3
New Mexico:											
Carlsbad.....	McMillan.....	45,000	3267.7	3241.6	.....	.....	.....	3,000	3253.6	3253.6	3253.6
Rio Grande.....	Elephant Butte.....	2,638,000	4407	4231.5	1,627,874	1,501,432	1,627,874	61,292	4377.7	4373.3	4377.7
Oregon, Umatilla.....	Cold Springs.....	50,000	621.5	560	1,875	1,100	1,875	979	568.35	565.59	568.35
Oregon-California, Klamath.....	Clear Lake.....	462,000	4540	4514	373,000	364,000	373,000	.....	4536.6	4536.2	4536.6
South Dakota, Belle Fourche.....	Belle Fourche.....	203,000	2975	2920	68,300	73,290	73,290	1,420	2953.1	2954.3	2954.3
Utah, Strawberry Valley.....	Strawberry.....	250,000	7558	7517	210,500	202,600	250,000	7,900	7552.5	7551.4	7558
Washington:											
Okanogan.....	Conconully.....	14,400	2290	2232	1,450	1,775	1,775	.....	2251	2252.7	2252.7
Yakima.....	Bumping Lake.....	34,000	3426	3389	2,314	2,737	2,932	.....	3392.6	3393.3	3393.6
	Lake Cle Elum.....	20,800	2134	2122	6,038	8,395	8,395	.....	2125.6	2126.7	2126.7
	Lake Kachess.....	210,000	2258	2192	40,710	31,092	40,710	9,618	2107.4	2103.9	2107.4
	Lake Keechelus.....	152,000	2515	2425	5,592	10,708	10,708	.....	2429.4	2433.5	2433.5
Wyoming, Shoshone.....	Shoshone.....	456,600	5360	5132.3	360,993	338,304	360,993	33,394	5344.5	5340.4	5344.5

¹ Or maximum storage.² Or zero storage.³ Zero water depth at elevation 1902.2.⁴ Amount of silt shown by silt survey deducted from original capacity.⁵ Proposed regulation.⁶ Estimated low-water limit under proposed plan of regulation.⁷ Draft for power purposes.⁸ Elevation of reservoir raised 12 inches by stop logs in spillway.

SALT RIVER PROJECT, ARIZONA.

Water was run in all of the canals during October.

Three regular crews were in the field, and the following maintenance work was accomplished: 55½ miles main canal cleaned, 77½ miles laterals cleaned, 119 old structures repaired, 1,714 linear feet riprap placed, 1,746 cubic yards earth moved.

In addition, the Ruth dredger bermed 39,100 linear feet of Arizona Canal, moving approximately 6,500 cubic yards.

The P. & H. ½-yard drag line moved approximately 4,000 cubic yards of earth in enlargement of the Chandler drain.

The following construction work was accomplished: 2.15 miles new waste ditch built, 25 new structures installed, 3,227 cubic yards earth excavated, 49.4 cubic yards concrete placed, 485 linear feet concrete pipe placed, 20 linear feet corrugated iron pipe placed.

The concrete-pipe plant operated during the entire month, turning out 1,804 linear feet of 24-inch concrete pipe.

Operation of power system.—Total power generated during month, 6,409,480 kilowatt hours; maximum daily output (October 8), 268,820 kilowatt hours;

maximum load (October 9), 11,650 kilowatts; maximum daily average load (October 8), 11,180 kilowatts; average daily load for month, 8,610 kilowatts; highest daily load factor, 99 per cent; lowest daily load factor, 60 per cent; monthly load factor, 73.9 per cent.

The Central Arizona Light & Power Co. released a total of 795,981 kilowatt hours during the month and supplied to our system 34,680 kilowatt hours of reversed power.

Owing to the drop in demand for irrigation water at the beginning of the irrigation year, the output of the power system was reduced to 5,800 kilowatts on October 1, gradually increasing to 11,335 kilowatts on October 10, and then gradually decreasing to 4,900 kilowatts at the end of the month.

The Roosevelt power plant operated 734.3 hours during the month, the Cross Cut plant 737.3 hours, the South Consolidated plant continuously, the Arizona Falls plant 730.8 hours, and the Chandler plant 642.4 hours.

The installation of the electrical river gauge at Roosevelt was started. A new stilling well for the float was installed, using 30-inch concrete pipe for same.—C. C. Cragin.

YUMA PROJECT, ARIZONA-CALIFORNIA.

Prices improved somewhat during October, an increase of 20 to 25 per cent being noted in both cotton and alfalfa seed. Weather conditions were favorable, and the top crop of cotton increased the yield and improved the quality of the crop considerably.

The 30-B Bucyrus drag line continued cleaning the main drain, completing 2.1 miles, about 2 miles more remaining to be cleaned. The Ruth dredges cleaned a total of 11½ miles of laterals. Work on replacing ties on the levee railroad was carried on.

Mesa division.—A small force was employed at the pipe-manufacturing plant making changes necessary for the manufacture of lock-joint pipe in 8-foot lengths. Bids for construction of distribution canals involving about 65,000 cubic yards of earthwork were opened October 16; award was made to J. H. Maxey, of Yuma, at 17½ cents per cubic yard. The 16-inch Krogh pump was operated 90 hours, pumping 135 acre-feet of water.—*R. M. Priest.*

ORLAND PROJECT, CALIFORNIA.

Frequent north winds, continuing for two and three day periods, occurred during October. Temperatures were normal.

Construction work, consisting of placing concrete lining under supplemental agreement with the water users, was resumed for the 1922-23 season on October 16. A shortage of labor prevented working to full capacity. Nineteen hundred linear feet of the old Lemon Home Canal were lined, 5,800 square yards of lining being placed. The average force engaged consisted of 30 men and 20 head of stock.

The cleaning and repair of the East Park Feed Canal were completed early in the month, after which

work of drilling anchor-bolt holes for the auxiliary gate at East Park Dam was commenced. Fourteen men and 10 head of stock were engaged in maintenance work on the project distribution system, consisting of the cleaning and repairing of 14 miles of concrete-lined sections and 1.3 miles of earth sections. Water deliveries were discontinued on October 6, following a rainfall of 1.35 inches. Deliveries amounted to 520 acre-feet.

Hearings in connection with the adjudication of water rights on the Stony Creek watershed were commenced on October 12 at Willows, Calif. After the Government's presentation of its case in chief the hearing was adjourned until November 13, when solicitors for the defendants will present their pleadings.—*R. O. E. Weber.*

GRAND VALLEY PROJECT, COLORADO.

October weather was favorable for all kinds of outside work.

Nearly all crops had been harvested, except sugar beets and some potatoes which were left in the ground. Beet digging was in progress, and the yield in most cases was quite satisfactory. There was little demand for apples and late pears, and the present season will not prove very profitable for the fruit growers. The season was favorable for alfalfa, and in some cases a fourth cutting was obtained. The price was \$9 per ton in the stack and the returns for this crop promise to be much better than last year.

The irrigation system was operated continuously, but the demand for water was light, the principal use being for softening the ground preparatory to beet digging and filling reservoirs for winter storage. The ditch riders were occupied in securing the crop reports and handling water deliveries. The irrigation season ended on the 31st.

Estimates for season 1921-22. Crop report, Salt River project, Arizona.

Crop.	Area (acres).	Unit.	Yields.		Values.		
			Average per acre.	Total.	Per unit of yield.	Total.	Per acre.
Alfalfa.....	47,796	Ton.....	4	191,184	\$12.00	\$2,294,208	\$48.00
Barley.....	14,775	Cwt.....	18	265,950	1.25	332,435	22.50
Beans.....	1,073	Pound.....	1,000	1,073,000	.06	64,380	60.00
Berries.....	98	Crate.....				45,080	460.00
Cantaloupes.....	3,851	.....do.....	200	770,200	.60	462,120	120.00
Corn.....	195	Pound.....	1,600	312,000	.02	6,240	32.00
Cotton (seed).....	71,238	.....do.....	850	60,552,300	.10	6,055,230	85.00
Fruits, citrus.....	2,108	.....do.....	7,000	14,756,000	.05	737,800	350.00
Fruit, deciduous.....	1,376	.....do.....	4,500	6,192,000	.03	185,760	135.00
Garden truck.....	2,040					459,000	225.00
Lettuce.....	784	Crate.....	275	215,600	1.60	344,960	440.00
Maise and feterita.....	17,330	Cwt.....	18	311,940	1.25	389,925	22.50
Sorghum.....	167	.....do.....	18	3,006	1.25	3,757	22.50
Oats.....	3,381	.....do.....	15	50,715	1.45	73,536	21.75
Pasture.....	16,690					250,365	15.00
Potatoes.....	1,114	Pound.....	7,000	7,798,000	.03	233,940	210.00
Vineyard.....	600	.....do.....	7,000	4,200,000	.06	252,000	420.00
Watermelons.....	569	Cwt.....	200	113,800	.72	81,936	144.00
Wheat.....	20,547	.....do.....	15	308,205	2.00	616,410	30.00
Asparagus.....	3	Pound.....				768	256.00
Sudan grass.....	205	Ton.....	5	1,025	8.00	8,200	40.00
Total and average.....						12,898,050	67.20

Total acreage cropped (not including town site area).....	Area (acres). 205,940	Plus home tracts including house lots, corrals, etc.....	Area (acres). 3,032
Less duplicated areas.....	14,020	Total area reported.....	200,488
Net area cropped.....	191,920	Plus town-site acreage on which no crop was reported.....	2,842
Plus vacant land, including roadways, ditches, etc.....	5,536	Total acreage receiving water service from project.....	203,330

Two drag-line excavators were operated on drainage work, completing 3,400 linear feet of drain, involving 14,000 cubic yards of excavation.

Work was continued on the construction of the plant and the assembling of equipment preparatory to beginning the work on the Orchard Mesa siphon under the Colorado River. A Monighan drag-line excavator was moved to this work and began excavation for the siphon on the 19th. Preparations were completed to proceed with the excavation under the railroad track as soon as a temporary bridge is constructed by the company. The gravel screening and concrete mixing plant was nearly completed. Two carloads of reinforcing steel and six cars of other materials and equipment were unloaded during the month.—*S. O. Harper.*

UNCOMPAHGRE PROJECT, COLORADO.

The dry weather which has prevailed since spring with the exception of August continued during October.

Work was begun on the construction of the timber headworks of the feeder ditch from the Uncompahgre River to the West Canal.

The uncollected water rentals due from the season 1921 on October 31 amounted to approximately \$3,581. The total cash collections to October 31 on account of water rentals for the season 1922 amounted to approximately \$65,200. The demand for irrigation water gradually decreased.

Owing to the decreased demand for irrigation water, the ditch riders were employed on alternate days in brushing canals and laterals and installation of riprap work. The repairs to the washed-out tunnel road over Vernal Mesa to River Portal were completed. All the metal flumes on the lower section of the project were given a heavy protective coating of tar along the bottom and at all the joints. The P. & H. drag line continued the cleaning and enlargement work on the Loutsenhizer Canal between the headworks and the North Mesa lateral headgate, 5,345 cubic yards being excavated.

The project forces were extremely busy during the early part of the month in taking water-right applications, pursuant to the public notice of April 12, 1922. On October 31 a total of 1,180 water-right applications had been completed, and in addition a total of approximately 300 acceptances had been received placing lands under the reclamation extension act. These acceptances will be converted into water-right applications prior to the irrigation season 1923.—*L. J. Foster.*

BOISE PROJECT, IDAHO.

October was unusually warm and dry. Apple picking was completed, but shipments were light, owing to market conditions and the shortage of refrigerator cars. Clover hulling was nearly completed. Both the yield and price were fair. The price for potatoes remained low. This, together with the car shortage, resulted in light shipments. Some of the potato growers were storing, in hopes that the market will strengthen before spring. There will be a considerable acreage, however, that will not be harvested. The head-lettuce crop was seriously damaged by hot weather during September and October. Shipments began the middle of October. Only the late-planted fields were giving good yields of marketable quality. The price received by the growers was very good. The hot, dry weather of the summer and fall left the ranges in poor shape. This caused the stockmen to

seek fall pasture on the irrigated farms, which resulted in a good price for both pasture and hay.

The run-off of Boise River was below normal. The watershed was extremely dry. Unless there is heavy precipitation before the ground freezes, conditions are not favorable for a well-distributed run-off during next season.

Water for irrigation was turned out of the canal system on October 22. The canals had sufficiently dried so that cleaning operations were begun a few days thereafter. By the end of the month a large force of men and teams were employed in order to complete the work before stormy weather. The Ruth machine was employed during the entire month in cleaning laterals in the west end of the project. Sluicing operations were begun at the Boise River Diversion Dam on October 22 to remove the large deposit of sand that had accumulated back of the dam during the spring and summer months.

One field party continued the surveys on the Malheur River, eastern Oregon, which are being conducted on a cooperative basis between the Reclamation Service, the State of Oregon, and the Warm Springs Irrigation district.—*J. B. Bond.*

KING HILL PROJECT, IDAHO.

October was favorable for all outside work.

Working from four camps, construction forces were engaged on canal and lateral enlargement and lining. Government forces removed 18,000 cubic yards of material in enlarging the earth section of the Main Canal, completing about 5 miles of this work.

The P. & H. No. 206 drag line was engaged throughout the month enlarging old laterals and construction of new laterals. Two small grading outfits were put on this work the latter part of the month. About 3 miles of laterals were completed.

Six thousand linear feet of puddled back fill were completed on sections of the canal to be concrete lined, 1,312 linear feet of 3-inch reinforced concrete lining, which is about one-fourth of the work proposed, had been completed at the end of the month.

Remodeling the Basin siphon and Canyon Creek siphon was under way, and 340 linear feet of 48-inch wood-stave pipe were removed from the Glens Ferry siphon at the O. S. L. R. crossing, preparatory to installation of lock-joint pipe at this point.

Work on the surface drains for protection of Head End Flume foundation was continued with a small force. About 10 per cent of this work remained to be done.

One hundred and twenty-five cubic yards of gravel were hauled to structure sites by contract. Long & Robertson completed 17 per cent of this contract, having placed 52,140 square feet of 3-inch lining. Seven small contract outfits removed 11,108 cubic yards of material on the Main Canal extension.

Two hundred and seventy-three square yards of rock paving and 260 square yards of brush riprap were placed at points demanding protection. Floor of the Guinite Flume was repaired and the Four-Mile Flume cleaned.—*A. M. Rawn.*

MINIDOKA PROJECT, IDAHO.

Warm, dry weather continued throughout most of October. There was a good demand for water until the end of the irrigation season. The season closed on the 15th and the pumping stations on the South Side Pumping Division were closed down. On the Gravity Division the water was shut out of the Main North Side Canal on the 18th. At Jackson Lake the

normal flow was discharged from the reservoir until the 14th, when the gates were closed for the season. The work of canal cleaning and structure repairs was begun as soon after the close of the season as possible.

All crops were harvested except beets and potatoes, which were about half gathered. It is probable that some potatoes will be left in the ground, the present price not justifying the expense of harvesting. There was little demand for this crop. Hay and wheat, however, were quoted at a fair price and there was good prospect of an increase in the price of sugar beets above the base price.

On the 23d the district court at Twin Falls vacated the order enjoining the county commissioners from calling an election to vote on the proposed reservoir district. Three days later the commissioners set January 16, 1923, as the date for this election.—*Barry Dibble.*

Prevailing crop prices at close of October, 1922.

Project.	Alfalfa hay, per ton.		Barley, per bushel.	Oats, per bushel.	Wheat, per bushel.	Potatoes, per bushel.
	In stack.	Baled at shipping point.				
Salt River.....	\$12-\$14	\$16-\$18	\$0.87	\$0.58	\$1.20	.....
Yuma.....	14.00	18.00	.....	.....	.....	.....
Orland.....	13.50	15.50	.62	.....	.....	.....
Grand Valley.....	9.00	12.00	.....	.50	.95	\$0.35
Uncompahgre.....	8-10	.....	.62	.42	.75	.25
Boise.....	8.00	11.00	.55	.40	.75	.20
King Hill.....	8.00	.....	.....	.....	.....	.36
Minidoka.....	8.00	.....	.36	.29	.81	.40
Huntley.....	8.00	.....	.....	.....	.85	.45
Milk River.....	7.00	10-12	.60	.40	.94	.45
Sun River.....	10.00	15.00	.55	.50	.94	.30
Lower Yellow- stone.....	6-8	9.00	.37	.24	.99	.30
North Platte.....	8.50	.....	.....	.....	.....	.30
Newlands.....	10.00	14.00	.75	.....	1.20	1.55
Carlsbad.....	.....	20.00	.....	.....	.....	.....
Rio Grande.....	.....	19-23	.....	.....	.....	.....
North Dakota pumping.....	10.00	.....	.38	.35	.98	.45
Umatilla.....	10-12	16.00	.....	.....	.....	.....
Klamath.....	8-10	.....	.60	.56	.96	.....
Belle Fourche.....	5.50	10.50	.36	.32	.90	.45
Strawberry Valley	8.00	11.00	.70	.50	.75	1.40
Okanogan.....	.....	.....	.....	.....	.....	.60
Yakima.....	13-14	.....	.....	.....	.....	.39
Shoshone.....	10.00	12.50	.50	.50	.76	.39
Indian projects:	.....	.....	.....	.....	.....	.....
Blackfeet.....	10.00	.....	.32	.45	.99	1.20
Flathead.....	10.00	15.00	.....	.....	.85	.30
Fort Peck.....	10.00	.....	.....	.20	.90	.50

¹ New.

HUNTLEY PROJECT, MONTANA.

Ideal weather conditions prevailed during the entire month of October, permitting the uninterrupted harvesting of the beet crop.

Water was run until the 9th, and was used principally in operating the Ruth machine. Maintenance work was confined to cleaning of ditches, maintenance of drains, and protective work to Lost Boy and Sand Creek flumes. The Austin drag line was put in the field on the 15th and cleaned 6,000 feet of reservoir line canal above Fly Creek crossing.

The paved section of open drain No. 16 at the crossing under the Northern Pacific Railway has been almost destroyed by alkali. Repair work on this drain was in progress and with favorable weather will be completed this fall.—*A. R. McGinness.*

MILK RIVER PROJECT, MONTANA.

October weather was dry, mild, and favorable for construction, maintenance, and farming operations other than fall plowing. Harvesting and thrashing were completed. Farmers and stock growers were seriously inconvenienced from shortage of stock, grain, hay, and potato cars.

Construction by Government forces consisted of working one drag line on waste-water ditches near Glasgow, another on drainage ditch near Dodson, and of placing a few small structures. Construction by contract was continued with good progress on Nelson Reservoir enlargement, with fair progress on seven lateral earthwork contracts, and with poor progress on structures for lateral system.

The Dodson South Canal was operated as a feeder to Nelson Reservoir. Other canals on the Malta and Glasgow divisions were operated for occasional service to a few water users; all canals except the Nelson Reservoir were closed for the season and no water was used on the Chinook division during the month. The Ruth dredger, which was laid up for the winter on the 28th, cleaned 9 miles of laterals on the Glasgow division in 30 shifts, or an average of 1,575 feet per shift. On October 14, 3,228 feet were cleaned in one shift, which is the record for the season. Work of filling a hole washed below Dodson Dam was begun, and preparations made for replacing a number of old wooden turnouts with the vitrified pipe structures.—*Geo. E. Stratton.*

ST. MARY STORAGE.

October weather conditions were exceptionally fine. Maintenance work consisted of clearing brush from the slide area at Sherburne Lakes Dam, removing two distorted sections from St. Mary crossing pressure pipe and replacing them with new sections and an expansion joint, repairing canal bank at mile 13, digging drainage trenches and back filling at Spider Coulee flume, and repairing rock-filled cribs at Swift Current diversion.—*R. M. Snell.*

SUN RIVER PROJECT, MONTANA.

October weather conditions were favorable and good progress was made by the earthwork contractors on part 2 of the Greenfields division. They moved a total of 36,500 cubic yards of class 1 excavation. The structural contractor concentrated his efforts on the completion of concrete structures and placed 130 cubic yards of concrete.

Good progress was made with the drag-line excavator on open drain A, and 3,650 linear feet were completed and 27,200 cubic yards of material moved, or an average of 566 yards per eight-hour shift.

No water was delivered on the Greenfields division, and on the Fort Shaw division a small quantity from the 1st to the 18th. Five concrete structures were built and considerable work done in cleaning lateral C and D extension. Tests were continued on the concrete-lined section of Greenfields Main Canal and plans started for making permanent repairs before the beginning of the next operating season.

The farmers were busy threshing grain, digging potatoes and other root crops, putting up the third cutting of alfalfa, and baling hay for shipment. The shipments from the several towns on the project were 35 cars of wheat, 6 cars of alfalfa, and 6 cars of potatoes.—*Geo. O. Sanford.*

LOWER YELLOWSTONE PROJECT, MONTANA-NORTH DAKOTA.

October was in general favorable for construction and maintenance work and harvesting.

Under contract 878 with Beauchaine & Klug, all concrete and timber work was completed. The back-filling of some of these structures was not all completed, as neither laborers nor teams could be secured. Under favorable weather conditions the back-filling will be completed by November 20. Under contract 883 with Gene Hoffstot the progress was slow, owing to the shortage of laborers. A contractor, Henry Swanson, under advertisement No. 54, a small earthwork contract, completed schedule 1, and good progress was made on schedule 2.

The irrigation season closed at the usual time, October 10, although water was run in the main canal the entire month to be used for priming main canal and lateral extensions and in keeping the material being excavated by the Ruth ditch cleaner in condition for economical excavation. Moving silt by the sluicing process, agitating the material with a disk, was carried on successfully from the pumping plant to the KK wasteway and for a distance of 1,000 feet above the Savage sluice gate. On the upper end of the project the maintenance crew, after completing the cutting of brush and trees in the Bell Hill vicinity, was engaged in placing the structures under the pumping unit in shape for next year's operation. On the lower end of the project the maintenance organization, other than the Ruth ditch cleaner crew, was engaged in priming the canal and lateral extensions. Considerable trouble was experienced in priming the 5 miles of main canal. The Ruth ditch-cleaning machine cleaned 5.6 miles of laterals, moving about 10,000 cubic yards of material.

The harvesting of all crops was nearly completed at the end of the month. Practically all that remained was a few fields of sugar beets and some corn. It is estimated that 25 per cent of the potato crop will be lost by either not being dug or there not being sufficient storage room and root cellars. The price of all commodities raised by the farmer other than wheat has been very low, but it has been reported, however, that the Great Western Sugar Co. will pay considerably more per ton for sugar beets than was originally expected.

The shipments of live stock from the project have been heavy. Why trainloads of poor stock should be shipped from this locality at this time is not understood, as there is a large quantity of surplus feed in the country, both on the project and on the dry lands adjacent thereto. A few carload shipments of lambs have been received in the Fairview district for feeding purposes. One of the biggest needs of the project at the present time is dairy cows, hogs, and sheep.—*L. H. Mitchell.*

NORTH PLATTE PROJECT, NEBRASKA-WYOMING.

Throughout October the Interstate Canal was operated for the purpose of filling the Lake Alice and Lake Minatare storage reservoirs, and at the end of the month the storage in Lake Alice amounted to 8,000 acre-feet and that in Lake Minatare to 41,000 acre-feet. On account of the necessity of having to construct the Sand Point culvert on the Interstate Canal before the beginning of next season's operation it will be impracticable to operate the canal any longer this season. The Point Laramie Canal was operated throughout the month for the first 25 miles in order to furnish water for the Lingle power plant.

On the Interstate division the Spottedtail flood-water channel was practically completed with the exception of placing some rock riprap. The replacement of decayed wooden structures on the third lateral district was seriously handicapped on account of the scarcity of labor.

On the Fort Laramie division the two class 9½ Bucyrus drag lines continued working downstream on the Main Canal and were at a point about 1 mile west of Mitchell. These machines were working three shifts each. The drag line on the Katzer drain continued with good progress, working three shifts. Satisfactory progress was made on the diversion for the Horse Creek lateral system. All of the wet excavation had been completed and the concrete placed below the water line. The entire structure should be completed about November 15. Practically all of the earthwork on the Horse Creek lateral system is covered by contracts, and about 2,000 yards of concrete had been placed by Government forces or covered by contracts, and about 2,000 yards of concrete remained to be contracted and placed by Government forces. It is expected to have all concrete placed on this system by May 1, 1923.

On the northport division the class 14 Bucyrus excavator continued working on the Indian Creek outlet channel and practically completed the main channel. About 5,000 cubic yards of concrete were placed on the main canal and lateral structures during the month.

The three Ruth excavators were used on cleaning laterals on the Interstate Division on the first, second, and third lateral districts and cleaned a total of 17.77 miles. The results obtained on this project with these machines are highly satisfactory. They do an excellent job of cleaning at a very reasonable cost.

The weather during the month was favorable for harvesting the beet and potato crops. However, heavy frosts on the nights of September 13, 15, and 17 caused quite a lot of damage to potatoes which had not been dug or were exposed in the fields.

Approximately 25,000 sheep were shipped in during the month for fattening on the project; also 1,600 head of cattle were brought in for feeding.—*Andrew Weiss.*

NEWLANDS PROJECT, NEVADA.

Favorable weather prevailed during October. Lahontan power plant was operated from Lahontan Reservoir and the Truckee Canal until the 17th, after which date operation was entirely from the canal.

Water was shut out of the distribution system on October 16. A short run after the 1st of November for the irrigation of winter grain in a limited area will complete the operation season for 1922.

Drainage work was continued and favorable progress was made. Construction of the lower diagonal drain, the largest drain planned from the standpoint of cross section, was commenced on October 19 with a Bucyrus class 14 drag line on excavation. In addition to this machine and drain, five other drag-line excavators, on a like number of drains, were in operation. One Austin drag line was employed on drain-cleaning work. On this drainage work approximately 220,300 cubic yards of material were moved by these machines. Thirty-eight timber structures, requiring the placing of 76,336 feet, board measure, of lumber, were placed in the drains.

The movement of alfalfa hay in the market was brisk. Prices received were \$14 per ton for baled alfalfa f. o. b. cars. Numerous sales to dairymen

and feeders were reported at \$10 per ton in the stack. It was extremely gratifying to note that a large portion of the alfalfa crop was being reserved for local consumption for dairy use in contrast to the previous necessity of shipping to outside markets. Potato harvest was in progress, with good yields of excellent potatoes reported. Demand was only fair, price low.—*D. S. Stuver.*

CARLSBAD PROJECT, NEW MEXICO.

October weather was generally fair and favorable for the maturing and picking of the cotton crop and for gathering other crops. The total amount of water delivered to the farms amounted to 2,340 acre-feet.

The small amount of water available was in the canal continuously. Deliveries were limited to the flow of the river between Lakes McMillan and Avalon, which averaged about 65 second-feet. A small maintenance force under the regular foreman was employed painting the cylinder spill gates and other steel work at Lake Avalon and the head gates at Lake McMillan and in hauling rock for repair work at road crossings on the upper reaches of the project.

Harvesting of the crops on the project was general. The last crop of hay was harvested during the latter part of the month. Price for good alfalfa hay averaged around \$20 per ton. All of the cotton gins on the project were working full time during the entire month. At the close of the month about 3,000 bales of cotton had been ginned. Cotton continued to be of excellent grade and was selling at prices ranging from 24.5 to 28.05 per pound.—*L. E. Foster.*

RIO GRANDE PROJECT, NEW MEXICO-TEXAS.

All excavating-machine work on drainage has been placed under two-shift operation. This includes three Bucyrus 9½ and one Monaghan 2-T drag line in the Mesilla Valley and two Bucyrus 9½ and one 30-B in the El Paso Valley. In the Mesilla Valley a total of 160,000 cubic yards were removed in drainage construction, and in the El Paso Valley, where the machines were not double shifted until the 15th of October, 87,000 cubic yards were excavated from drains. Lateral work in the Mesilla Valley progressed with the operation of two Ruth ditching machines continuing on the reconstruction of old laterals and two P. & H. excavators working on new combined lateral and levee construction, and following the close of the irrigation season a good start had been made on structure work. In the El Paso Valley lateral construction progressed with the operation of one Ruth ditching machine, which completed 5.8 miles of lateral, and the P. & H. excavator began the reconstruction of the last schedule of the Franklin Canal. Following the close of the irrigation season, considerable work was done on lateral reconstruction, consisting of structure work and team excavation, 16,200 cubic yards being moved by teams in bank improvement. Field cost on drainage excavation averaged 6.7 cents.

The irrigation season proper closed on October 15 and the winter schedule was begun, the discharge from Elephant Butte reservoir being reduced to 500 second-feet, which is to be diverted alternately in 15-day periods between the El Paso and Mesilla Valleys during the winter. There is still an absence of inflow into the reservoir and the storage decrease was 126,000 acre-feet. Crop conditions were generally above the average. There was a large cotton yield, with good prices for the lint and satisfactory prices for alfalfa, which have made the year generally profitable for the farmers.

The first individual payment for construction charges was received by the El Paso County water improvement district No. 1 from Mrs. Mattie P. Graves, of Ysleta. (See special article in this issue.)

District Counsel P. W. Dent, after several years spent on the Rio Grande project, has been transferred to the district counsel's office at San Francisco.—*L. M. Lawson.*

NORTH DAKOTA PUMPING PROJECT.

October weather was clear and cool. Conditions were favorable for thrashing and for the harvesting of all crops. Most of the potato crop was well taken care of by the end of the month, with several carloads in the potato warehouse of the Williston Cooperative Marketing Association, a corporation organized by the project farmers primarily to market the Early Triumph seed potatoes, which are exceptionally good in this locality, direct to the southern grower. About 25 carloads of potatoes are being shipped now, which are netting the farmers 40 to 45 cents per bushel.

The power plant was in continuous operation for the commercial-power contract; 101,800 kilowatt-hours were delivered to the city of Williston during the month.

Nine hundred and twenty-one tons of coal were mined.—*A. R. Barbour.*

UMATILLA PROJECT, OREGON.

Favorable weather prevailed throughout October. The first killing frost occurred on October 28. No damage was done, all crops having been harvested.

Preparation of land for seeding alfalfa, baling of hay, and picking and packing of apples were engaged in. Shortage of cars for shipping was causing worry.

On the west division three ditch riders were employed distributing water and taking crop reports.

East division.—The work in connection with the improvement of the A Canal was in progress. Shortage of labor and materials delayed the work considerably. The pipe manufacturing crew produced 500 linear feet of 12-inch, 1,300 linear feet in 16-inch, and 1,556 linear feet of 20-inch concrete pipe.

West division.—Two thousand six hundred and fifty linear feet of 16-inch concrete pipe were laid in connection with the lateral system delivering water to land within the west extension irrigation district. This work was also delayed owing to the difficulty in securing cars for the shipment of pipe.

C. P. Adams, prominent hog breeder of Hermiston, had his herd practically wiped out by what the State veterinarian pronounced cholera. Measures were taken to prevent the spread of the disease. So far only a few cases have occurred since. The loss of Mr. Adams is very serious, as virtually all his prize-winning hogs, the result of years of selective breeding, were included.—*H. M. Schilling.*

KLAMATH PROJECT, OREGON-CALIFORNIA.

No water for irrigation was run in any of the project canals during October. The diversion canal was operated all month diverting water from Lost River to the Klamath River.

The farmers had completed practically all work in connection with harvesting this year's crop. They were engaged in hauling grain to market and in preparing their farms for next year. A large part of the project hay crop had been sold to local stockmen;

prices averaged around \$8 per ton in the stack. Several bands of sheep and cattle were being pastured on the project farms and it is likely that a large amount of live stock will be fed on the project during the coming winter.

In the Tule Lake division good progress was being made on the construction of the canal and lateral system. The excavation was being done by four drag-line excavators. The material for constructing the laterals was being borrowed from parallel waste ditches. Practically all of the canal structures were being built of reinforced concrete.

The embankment for the Langell Valley diversion dam and the excavation for the foundation for the spillway structure had been completed. About one-fourth of the concrete for the spillway had been placed.

On October 27, 174 farm units in the Tule Lake division were opened to homestead entry. The construction charge was announced at \$90 per acre. To the end of October applications had been made for 54 of the farm units.

Director Davis, of the Reclamation Service; Mr. Glenn L. Parker, district engineer, United States Geological Survey, of Tacoma, Wash.; Mr. Herman Stabler, United States Geological Survey, of Washington, D. C.; and Mr. F. B. Headley, superintendent, experiment farm, of Fallon, Nev., arrived on the project the evening of the 10th for a hearing dealing with Tule Lake lands, the reclamation of Hanks, Marsh, and other matters. Messrs. Stabler and Parker left on the morning of the 16th, and Director Davis and Mr. Headley left on the morning of the 17th.—*H. D. Newell.*

BELLE FOURCHE PROJECT, SOUTH DAKOTA.

October weather was warm and open. Roads were fine and everything favored outdoor work.

Only a limited amount of maintenance work was in progress. The top of the Belle Fourche Dam was graded off, giving a slight pitch toward the lower toe, and some drilling was done preparatory to increasing the height of the parapet wall 2 feet. Three concrete chutes were built to replace worn-out wooden structures, and some repair was done on minor structures. The Baby Ruth dredger was employed throughout the month on small laterals. During the season this machine has gone over nearly all of the laterals in the Vale district.

Large numbers of sheep have been driven in from the range and loaded for shipment at Newell and Belle Fourche. A considerable number of farmers have bought ewes and will winter them on the project. Should the present price for wool and lambs be received next year good returns should be realized. Were all farmers able to stock up with breeding ewes, a good market would be furnished for the thousands of tons of surplus hay on the project.—*B. E. Hayden.*

STRAWBERRY VALLEY PROJECT, UTAH.

Weather during October was the mildest and driest of any October for the past 22 years. Conditions were especially favorable for the harvesting of all crops. At the end of the month all crops had been harvested with the exception of sugar beets and potatoes. Yield of all crops has been about average, but the price of farm products remained unsatisfactory. Sugar factories at Spanish Fork and Springville began operations on the 10th. The sugar factory at Payton will remain closed this year, the beet crop

for the Payton district being handled by the Spanish Fork plant.

Delivery of water for irrigation purposes continued until the 16th, when all gates at East Portal were shut down and the irrigation season of 1922 brought to a close. A total of 4,711 acre-feet of water was drawn from Strawberry Reservoir during the month, 2,764 acre-feet of which were delivered to the High Line division, 1,630 to the Spanish Fork division, and 317 acre-feet to the Springville-Mapleton division. The total amount of irrigation water delivered to the several divisions of the project during the irrigation season of 1922 was 142,510 acre-feet, 79,830 acre-feet of which were derived from the Spanish Fork River. The seasonal deliveries were as follows: High Line division, 42,341 acre-feet; Spanish Fork division, 89,667 acre-feet; and Mapleton and Springville irrigation districts, 10,492 acre-feet.

Repairs to the wasteway and upper plunge basin at the power plant were started on the 8th, and by the end of the month good progress had been made.

The project power plant was in continuous operation, delivering 112,351 kilowatt-hours to the several project towns, from which revenue amounting to \$2,144.95 were received.—*W. L. Whittemore.*

OKANOGAN PROJECT, WASHINGTON.

October weather was favorable for the work of the service and the harvesting of the apple crop, being warmer than usual for the season of the year.

Work for the month consisted of the regular routine office work, with a maintenance crew of four men engaged in putting the irrigation system in shape for the winter and two men engaged in mechanical and electrical work.

The car shortage, caused by the recent strike, seriously impeded the movement of the apple crop, only about one-third of the crop having been shipped at the end of the month, whereas two-thirds should have been shipped. The project is short approximately 575 cars of the number required at the time of this report to handle the crop in proper shape.—*W. D. Funk.*

YAKIMA PROJECT, WASHINGTON.

October weather was warm and dry until the latter part of the month, when fall rains began.

Sunnyside division.—Delivery of water for the season of 1922 was discontinued on October 31. After the 15th deliveries were almost entirely for stock and domestic purposes. Several of the pumping units were operated only a portion of the month, and all had been closed down by the 31st. Maintenance work accomplished consisted of cleaning and painting siphon No. 1 of the Benton Canal and pipe line on lateral 59.31 and repair and replacement of structures. Forty wood structures were repaired or replaced and 11 concrete structures were built. Preparations were under way at the close of the month for beginning the fall program of berm work, gravel riprapping, and cleaning of canals and laterals.

Tieton division.—Water was turned out of the Tieton Canal on October 3, closing the irrigation season of 1922, the storage supply in Bumping Lake and Clear Creek Reservoirs, being entirely exhausted at that time. Maintenance work consisted of cleaning and painting steel flumes on laterals E and G, repair and replacement of 66 linear feet of 30-inch concrete pipe on the D-1 siphon, installation of 700 feet of 12-inch wood pipe to replace small wood flume, and installation of 1,500 linear feet of concrete pipe, size

6 to 12 inches, in cooperation with individual water users. Cleaning of main laterals was begun during the latter part of the month under the direction of the ditch riders with a force of 15 men and 20 teams.

Storage reservoirs.—Lake Keechelus was closed on October 3 and Kachees on the 19th. Bumping Lake remained wide open throughout the month, and Cle Elum was regulated to discharge 172 second-feet throughout the month. The sump at the outlet works of Lake Keechelus Reservoir was pumped out on October 29 and the emergency gates and lower control gate thoroughly inspected. The timbers were slightly worn down, but gates, castings, seatings, concrete, etc., were in good condition. Piling of logs continued at Lake Keechelus.—*J. L. Lytel.*

TIETON DAM.

October weather was favorable for construction work. Hauling conditions were good. An average force of 472 men was employed.

Ninety-eight thousand two hundred cubic yards of embankment and 1,205 cubic yards of concrete core wall were placed during the month. Reservoir clearing was continued with 70 men and 15 teams. The rain made it possible to burn the timber that had been cut and piled.—*F. T. Crowe.*

RIVERTON PROJECT, WYOMING.

October weather was favorable for construction until the 28th. The roads were in good condition up to that time. The flow of Wind River was about 20 per cent less than normal.

On the Wind River Diversion Dam drag line 121474 excavated 4,809 cubic yards of material for the weir. Drag line 121322 collected and screened gravel for concrete. Work was continued on the overflow portion of this structure; 2,055 cubic yards of plain concrete and 120 cubic yards of reinforced concrete were placed. Work was greatly delayed through inability to secure cement, about 10 days' working time being lost for this reason. The weir proper was 50 per cent completed.—*H. D. Comstock.*

SHOSHONE PROJECT, WYOMING.

October was an unusually pleasant month, well suited to harvesting and construction work. A storm period beginning the 28th brought rain, followed by snow, and delayed late harvesting of sugar beets and potatoes.

At the Willwood Dam work was in progress on the excavation of the tunnel connecting the dam and open cut and on excavating the foundation for the south abutment and south half of the dam. Both of these features were about 90 per cent completed. In the excavation of the dam foundation use was made of a class 14 electric drag line and very satisfactory progress and costs were secured. About 8,000 cubic yards of class 1 and 3 material, mostly wet, were then excavated. The cofferdam inclosing the work was constructed of material found at the site and has proven satisfactory, as little pumping was required. Owing to the use of the drag line at the dam, no excavation work was done on the Willwood Canal, but a considerable amount of class 2 and 3 excavation was drilled and blasted in anticipation of the return of the drag line to the canal excavation.

The contractor for the Willwood bridge constructed the abutments for this structure during the month.

Drainage work on the Garland and Frannie divisions was continued with the same forces as in the past few months, and 6.88 miles of open drains were

constructed by seven machines, two being P. & H. one-half cubic yard machines.

Harvesting of beets and potatoes and threshing of small grains were in progress the entire month. Owing to the low price for potatoes, the major portion of this crop was being stored on the farms. One hundred and twenty-nine carloads of potatoes and 148 carloads of beets were shipped during the month. The alfalfa mill at Powell began grinding for the season on the 28th. An advance in price from \$8 to \$10 per ton for loose alfalfa hay occurred during the month.

The entire system of the project was in operation throughout the month, water being turned off for the season on the 31st. In consequence maintenance work was light. Deliveries were small and the season's water consumption was slightly below the average. The Shoshone power plant was operated continuously, generating 149,300 kilowatt-hours, of which 95,760 kilowatt-hours were delivered to construction work and 10,900 kilowatt-hours to commercial connections.—*J. S. Longwell.*

INDIAN PROJECTS, MONTANA.

BLACKFEET PROJECT.

October weather was exceptionally mild and favorable for construction, operation, and maintenance, threshing, and hauling crops to market.

Construction work consisted of completing excavation and concrete work on the second drop and completing canal excavation with the drag line on the Four Horns Outlet Canal. Indian labor was employed entirely, and no attempt was made to hire white men for construction work.

Operation maintenance work consisted of operating three of the canal systems for a short time the first of the month for fall irrigation and for delivering water for domestic purposes and making minor repairs to canals and structures.

Owing to favorable weather conditions, all of the threshing was completed and considerable of the crops were hauled to market. Although the season on the whole was exceptionally favorable for crop growth, the average yield on the project was not high, as the best farming methods were not employed in most cases.—*R. M. Snell.*

FLATHEAD PROJECT.

October weather was excellent.

At the Hubbard Dam stripping operations continued. The bedrock was laid bare on the west half of the river bed. Stripping on the east side was completed except for wet excavation below the natural water surface elevation of the river. The use of the steam shovel was discontinued on the 28th, and the remainder of the excavation will be handled by drag-line excavator. Construction of gravel-screening plant, sand and gravel storage bins, and concrete-mixing plant was practically completed. About 5,500 sacks of cement were delivered to the dam site by the hauling contractor.

On the Tabor Feed Canal the steam shovel advanced 2,905 linear feet, excavating 22,257 cubic yards of material, of which 8,000 cubic yards were class 2. Excavation was completed to station 90 + 35. Clearing of right of way was completed to station 135 + 00. Four thousand, eight hundred and fifty linear feet were cleared during the month.

Excavation of miscellaneous lateral extension by farmers amounted to 19,000 cubic yards in making 9½ miles of small laterals.

Water was turned out of the canals and laterals on the 10th. Five hundred twenty-five acre-feet were delivered to farms during the month. Operation and maintenance forces were employed on repairing structures, cleaning ditches, and miscellaneous construction work.

There was considerable activity in hay movement; baled hay was being shipped, and local demand was responsible for some large transfers of hay in the stack for winter feeding.—*C. J. Moody.*

FORT PECK PROJECT.

October weather continued favorable for all kinds of field work and the marketing of crops.

All operating forces were employed on cleaning the more important canals and laterals and general minor repairs to canals and structures. About 2 miles of lateral were cleaned, removing over 500 cubic yards of material.

Government forces were employed in the construction of 2 miles of lateral in the Big Porcupine division, involving 4,000 cubic yards, class 1 excavation.

Little fall plowing was being done, owing to the exceptionally dry condition of the ground. All threshing was completed at the end of the month, and the roads remained in good condition for marketing. Corn and potato crops were well matured and harvested in good condition.

Live-stock conditions were very good. Some cattle and horses were being shipped to eastern markets. Fall ranges were in excellent shape, and stock will not require feeding for some time.—*E. L. Decker.*

GENERAL OFFICES.

Washington office.—Director Davis was in the field the entire month. From San Francisco, which he reached on September 29 after his trip down the Colorado River, he went to Orland and Klamath Falls for the meeting of the Board of Review for the Klamath project, leaving there on October 17 for Redding, Red Bluff, San Francisco, Los Angeles, Yuma, El Paso, and Denver, where he arrived on October 28. He attended the meeting of the Colo-

Comparison between operation and maintenance estimates and results, January 1 to October 31, 1922.

Project.	Gross cost.				Net accruals and revenues.				Area for which water is available.
	Estimate for 1922.		Actual cost to Oct. 31.	Amount * over or under.	Estimate for 1922.		Actual returns to Oct. 31.	Amount more or * less than estimate.	
	Total for year.	To Oct. 31.			Total for year.	To Oct. 31.			
UNDER PUBLIC NOTICE.									
Belle Fourche.....	\$70,000	\$66,500	\$53,000	\$13,500	\$101,153	\$101,153	¹ \$101,153	-----	\$82,500
Boise.....	290,000	254,000	207,000	47,000	290,000	288,000	302,000	\$14,000	167,300
Carlsbad.....	52,000	43,000	49,500	*6,500	56,625	55,200	49,000	*6,200	25,000
Huntley.....	45,000	39,800	36,000	3,800	46,500	46,500	46,200	*300	30,000
King Hill.....	35,500	25,400	26,800	*1,400	² 35,500	25,400	26,800	1,400	16,900
Klamath.....	55,000	51,000	37,800	13,200	² 55,000	51,000	37,800	*13,200	51,000
Lower Yellowstone.....	36,000	33,000	26,500	6,500	² 36,000	33,000	26,500	*6,500	40,000
Minidoka (South Side).....	94,000	82,000	65,000	17,000	95,300	95,300	101,300	6,000	49,000
Newlands.....	105,000	87,000	99,000	*12,000	121,000	121,000	125,000	4,000	72,200
North Dakota Pumping.....	35,000	32,000	28,000	4,000	² 30,820	30,820	30,820	-----	7,650
North Platte (Interstate).....	165,000	153,000	155,000	*2,000	166,700	145,500	164,000	18,500	³ 130,000
Okanogan.....	37,000	34,000	39,000	*5,000	² 53,720	50,720	53,720	3,000	8,460
Orland.....	35,000	28,800	27,500	1,300	35,230	35,230	35,500	270	20,500
Rio Grande.....	231,000	203,000	193,000	10,000	² 233,945	205,945	195,945	*10,000	116,000
Shoshone.....	70,000	64,500	66,000	8,500	75,750	75,750	71,500	*4,250	71,100
Strawberry Valley.....	⁴ 25,000	20,900	20,800	100	⁵ 52,500	51,000	51,500	500	59,100
Sun River (Fort Shaw).....	14,000	13,700	13,700	-----	15,600	15,600	13,600	*2,000	13,900
Umatilla.....	37,280	32,500	31,000	1,500	² 37,280	32,500	31,000	*1,500	24,400
Yakima:									
Sunnyside.....	130,000	111,000	103,000	8,000	148,776	148,776	152,000	3,224	103,000
Tieton.....	84,000	66,000	63,000	-----	89,800	89,500	87,500	*2,000	32,000
Yuma.....	260,000	232,000	218,000	14,000	262,000	235,000	225,000	*10,000	63,200
Total.....	1,905,780	1,673,100	1,551,600	121,500	2,039,199	1,932,894	1,927,838	*5,056	1,183,410
UNDER WATER RENTALS.									
Grand Valley.....	50,000	40,000	42,000	*2,000	50,800	50,000	44,800	*5,200	38,400
Milk River (including St. Mary).....	71,500	65,500	51,200	14,300	22,000	22,000	21,000	*1,000	⁶ 74,000
North Platte (Fort Laramie).....	70,000	61,500	51,000	10,500	53,000	51,000	46,000	*5,000	43,400
Sun River (Greenfields and Big Coulee).....	25,000	24,200	22,300	1,900	30,000	30,000	14,000	*16,000	28,500
Uncompahgre.....	135,000	107,000	123,000	*16,000	142,500	100,000	61,000	*39,000	100,000
Total.....	351,500	298,200	289,500	8,700	298,300	253,000	186,800	*66,200	284,300
INDIAN PROJECTS.									
Blackfeet.....	30,000	28,400	17,800	10,600	19,700	19,700	6,200	*13,500	21,500
Flathead.....	65,000	59,000	44,000	15,000	58,000	58,000	37,000	*21,000	105,000
Fort Peck.....	14,600	12,400	12,000	400	1,000	1,000	600	*400	22,400
Total.....	109,600	99,800	73,800	26,000	78,700	78,700	43,800	*34,900	148,900

¹ Based on minimum charge.

² Returns regulated by district contract.

³ Includes 17,000 acres for which water is carried in main canal.

⁴ Not including tunnel repairs.

⁵ Includes installment of \$25,000 for tunnel repairs.

⁶ Stored water is furnished through the St. Mary Canal for 21,600 acres additional.

rado River Commission at Santa Fe, beginning on November 9.

During the absence of the director the office was in charge of Assistant Director Morris Blen as acting director.

Chief Counsel Hamel was in the office the entire month, leaving early in November for the meeting of the Colorado River Commission.

Galley and page proofs of the Twenty-first Annual Report were corrected and returned to the printer, and copies of the report are expected shortly.

Up to the end of the month 2,000 applications for relief had been filed by individual water users under the act of March 31, 1922.

During the month 175 purchase orders were placed, 12 advertisements issued, and 30 referred to the General Supply Committee. Purchases amounted to \$7,846.10. The storehouse filled 253 requisitions and made 33 sales from stock, the total value amounting to \$2,834.87.

Publications issued during the month comprised 34 copies of the annual reports and 403 miscellaneous publications. The 19 mimeograph jobs amounted to a total run of 11,470 sheets.

The number of inquiries concerning the service and opportunities for settlement answered by the settlement and information section amounted to 530.

At the end of the month the total number of inquiries from ex-service men concerning opportunities on the land amounted to 194,971.

The photographic laboratory turned out work during the month to the value of \$264.22, distributed as follows: Washington office, \$200.47; field, \$56.95; sales, \$6.80.

Denver office.—The chief engineer returned to the Denver office on October 27. During October he visited the Baker and Boise projects. Assistant Chief Engineer Charles P. Williams was in the field at the beginning of the month and returned to Denver on October 27. During the month he visited the Milk River, Sun River, Huntley, and Shoshone projects. Engineer James Munn was also in the field at the beginning of October, returning to Denver on October 14. During the month he visited the Yakima and Baker projects.

The principal work accomplished in the designing section consisted of the following: Prepared design for temporary suspension bridge for construction highway and railway traffic, 160-foot span, Black Canyon Dam; completed and traced details of drawings for end portions of Black Canyon Dam and began studies of economic design of drum gates and general arrangement of automatic operating equipment, Black Canyon Dam, Boise project; prepared design for 3 feet 6 inches by 8 feet cast-iron gates for wasteway, Orchard Mesa siphon, Grand Valley project; partially prepared studies and designs for Tabor Feed Canal above Falls Creek and design for Falls Creek crossing, Flathead project; partially prepared designs for 54-inch concrete pipe siphon, Main Canal extension, Station 1039+74 and for siphon at Station 134+15, King Hill project; completed design of checks, Main Canal, below laterals L, O, and I, Lower Yellowstone project; completed design for Dodson Lake control structure on Indian Creek drain and for enlarging Red Willow Creek wasteway, Tri-State Canal; prepared detail design for Tunnel No. 3, Fort Laramie Canal; partially completed detail drawings for machinery for operating headworks and sluice gates, Interstate and Fort Laramie main canals; and prepared designs for Sand-

point culvert, Interstate Canal, North Platte project; partially prepared design for siphon, Wyoming Canal, Station 110; completed design for transition, earth to lined section, Station 169+80, and completed design for transition, Station 332; prepared detailed design for culvert under Wyoming Canal at Station 380+35; partially prepared design for highway bridge, Wyoming Canal, Station 297, and completed design for structure at Station 13+20, Wyoming Canal, Riverton project; completed detailed design for flume, lateral G M-27, over drain A, and for flume, lateral G M-77-15-2-1, over this drain, Sun River project; prepared designs for forms for 33-inch lock-joint concrete pipe in 8-foot units for Granger siphon, Yakima project; prepared detailed design for turnout and flume, lateral B, Station 13+41, and for road crossing and turnout basins, lateral B-25, Stations 26+23 and 50+06, Yuma auxiliary.

The principal work accomplished in the electrical section consisted of the following: Arrangements were made for securing new motor and control equipment for the Lidgerwood cableway at Black Canyon Dam. Because of long delivery on new equipment, it was decided to transfer both motor and control from the Rio Grande project. Specifications and drawings for the new pumping units, Black Canyon pumping plant, were completed and forwarded to Washington to be printed and issued. Proposals will be opened December 6. Pencil detail drawings of the 5 by 5 sluiceways at Black Canyon Dam were completed and tracings started, and the design of the installation of the gates was completed. Designs of new thrust and steady bearings for the direct-pumping units on Laterals Nos. 3 and 4 for new canal structures for these plants were prepared for the King Hill project and forwarded to the project for final checking. A preliminary design of the Dry Lake pumping plant, Klamath project, was completed and forwarded to the project to be checked. Pencil detail drawings for the 5 by 6 high-pressure emergency gates at Tieton Dam are ready for tracing, and the detail drawings for the structural steel for the electrification of the Valley drainage plant, Yuma project, were completed and advertisements issued. Manufacturer's drawings for electrical apparatus were approved and returned to the manufacturer. The designs for the installation of the new electrical equipment were continued and are now about 75 per cent completed.

The cost and property section arranged for the transfer of \$19,021.12 worth of property, and sales amounting to \$594, were made.

The more important matters considered by the legal section were: Draft of an act to provide for exchange of lands between Anton Hiersche and the United States, North Platte project; appropriation of water from Sage Creek, a tributary of the Shoshone River, for the Deaver Canal, Shoshone project; proposed suit against Canute E. McClanathan to collect delinquent operation and maintenance charges, Sun River project; and postponement of construction charges for lands within Elephant Butte irrigation district, under act of March 31, 1922, Rio Grande project.

The disbursing section handled 932 vouchers, involving an expenditure of \$188,074.77; and in the purchasing section 372 advertisements were issued, 499 vouchers were prepared, involving a net expenditure of \$110,832.53, 350 rates were furnished for basing purposes in awarding orders and making transfers, and 341 bills of lading were issued to provide movement for materials purchased and transferred.

ADMINISTRATIVE ORGANIZATION.

DEPARTMENT OF THE INTERIOR.

HON. ALBERT B. FALL, Secretary of the Interior.
 EDWARD C. FINNEY, First Assistant Secretary.
 FRANCIS M. GOODWIN, Assistant Secretary.
 EDWIN S. BOOTH, Solicitor for the Interior Department.
 CHARLES V. SAFFORD, Administrative Assistant to the Secretary.
 MORGAN R. BROCK, Assistant to the Secretary.
 HARRY G. CLUNN, Private Secretary to the Secretary.
 JOHN HARVEY, Chief Clerk and Superintendent of Buildings.

U. S. RECLAMATION SERVICE.

WASHINGTON, D. C.

Arthur Powell Davis, director; Morris Bien, assistant director; Ottamar Hamel, chief counsel; J. B. Beadle, director's assistant; C. J. Blanchard, statistician; Hugh A. Brown, editor and office assistant; C. A. Bissell, engineer; J. M. Luney, chief accountant; C. A. Lyman, repayment accounting; Miss H. A. Fellows and Raymond Depue, fiscal agents; C. H. Fitch, chief clerk; Emmet Carr, purchasing agent; G. W. Numbers, appointment clerk; H. N. Bickel, Yakima, Wash., and W. F. Kubach, Denver, Colo., examiners of accounts.

DENVER, COLO.

F. E. Weymouth, chief engineer, Wilda Building, Denver, Colo.; R. F. Walter and C. P. Williams, assistant chief engineers; Miss L. H. Meisel, secretary to the chief engineer; J. M. Gaylord, electrical engineer; J. L. Savage, designing engineer; James Munn, engineer; W. A. Meyer, chief clerk; A. McD. Brooks, purchasing agent; Harry Caden, fiscal agent.

FIELD LEGAL OFFICES.

Boise, Idaho.—B. E. Stoutemyer, district counsel. Projects: Boise, Minidoka, King Hill, and Jackson Lake Enlargement.

Denver, Colo.—Law section office of chief engineer: R. M. Patrick and Armand Offutt, district counsel.

Las Cruces, N. Mex.—Mark B. Thompson, attorney. Projects: Rio Grande, Carlsbad, and Hondo.

Helena, Mont.—E. E. Roddis, district counsel, Helena, Mont. Projects: Blackfeet, Flathead, Fort Peck, Huntley, Milk River, St. Mary Storage, Sun River, North Dakota Pumping, Lower Yellowstone, and Shoshone.

Mitchell, Nebr.—J. N. Beardslee, district counsel. Projects: North Platte, Belle Fourche, and Riverton.

Montrose, Colo.—J. R. Alexander, district counsel. Projects: Grand Valley, Uncompahgre, and Strawberry Valley.

Portland, Oreg.—H. L. Holgate and D. G. Tyree, district counsel. Projects: Yakima, Okanogan, Umatilla, Klamath, and Baker.

San Francisco, Calif.—P. W. Dent and Brooks Fullerton, district counsel, 349 Pacific Building. Projects: Salt River, Yuma, Orland, and Newlands.

PROJECT ORGANIZATION.

Belle Fourche Project.—B. E. Hayden, project manager, Newell, S. Dak.; R. C. Walber, chief clerk.

Boise Project.—J. B. Bond, project manager, Boise, Idaho; Walter Ward, engineer in charge construction Black Canyon Dam; E. R. Mills, chief clerk; C. F. Weinlauf, fiscal agent.

Carlsbad Project.—L. E. Foster, project manager, Carlsbad, N. Mex.; V. L. Minter, chief clerk and fiscal agent.

Grand Valley Project.—S. O. Harper, project manager, Grand Junction, Colo.; C. H. Young, chief clerk; A. H. Hall, fiscal agent.

Huntley Project.—A. R. McGinness, project manager, Ballantine, Mont.; G. H. Bolt, chief clerk; Miss M. C. Simek, fiscal agent.

King Hill Project.—A. M. Rawn, project manager, King Hill, Idaho; T. W. Hause, chief clerk; W. S. Gillogly, fiscal agent.

Klamath Project.—H. D. Newell, project manager, Klamath Falls, Oreg.; N. G. Wheeler, chief clerk; G. R. Barnhart, fiscal agent.

Lower Yellowstone Project.—L. H. Mitchell, project manager, Savage, Mont.; C. A. Denman, chief clerk.

Milk River Project.—G. E. Stratton, project manager, Malta, Mont.; H. A. Parker, engineer; E. E. Chabot, chief clerk; G. S. Moore, fiscal agent.

Minidoka Project.—Barry Dibble, project manager, Burley, Idaho; Dana Templin, engineer; E. C. Diehl, chief clerk; Miss A. J. Larson, fiscal agent; F. A. Banks, engineer, American Falls, Idaho.

Newlands Project.—J. F. Richardson, project manager, Fallon, Nev.; A. W. Walker, engineer; G. B. Snow, chief clerk; Miss Ethel M. Simmonds, fiscal agent.

North Dakota Pumping Project.—W. S. Arthur, project manager and chief clerk, Williston, N. Dak.; H. C. Melaas, fiscal agent.

North Platte Project.—Andrew Weiss, project manager, Mitchell, Nebr.; H. W. Bashore, engineer, Fort Laramie Division; Paul Rothl, irrigation manager; J. R. Ummel, chief clerk; Mrs. A. L. Truax, fiscal agent.

Okanogan Project.—Calvin Casteel, project manager, Okanogan, Wash.; W. D. Funk, chief clerk and fiscal agent.

Orland Project.—R. C. E. Weber, project manager, Orland, Calif.; E. T. Eriksen, engineer; C. H. Lillingston, chief clerk and fiscal agent.

Rio Grande Project.—L. M. Lawson, project manager, El Paso, Tex.; T. W. Parry, irrigation manager; C. A. Peavey, chief clerk; L. S. Kennicott, fiscal agent.

Riverton Project.—H. D. Comstock, project manager, Riverton, Wyo.; R. M. Conner, engineer; G. H. Murphy, chief clerk; W. J. Fogarty, fiscal agent.

St. Mary Storage Division.—R. M. Snell, project manager, Brown, Mont.; F. H. Shiner, chief clerk and fiscal agent.

Salt River Project.—Being operated by the Salt River Valley Water Users' Association; C. C. Cragin, general superintendent and chief engineer, Phoenix, Ariz.

Shoshone Project.—J. S. Longwell, project manager, Powell, Wyo.; J. R. Iakisch, engineer; C. M. Jump, superintendent of irrigation; W. F. Sha, chief clerk; Miss L. C. Drinkwater, fiscal agent.

Strawberry Valley Project.—W. L. Whittemore, project manager, Provo, Utah; J. E. Overlade, chief clerk and fiscal agent.

Sun River Project.—G. O. Sanford, project manager, Great Falls, Mont.; H. W. Johnson, chief clerk; G. A. Benjamin, irrigation manager, Fairfield, Mont.

Umatilla Project.—H. M. Schilling, project manager, Hermiston, Oreg.; G. C. Patterson, chief clerk and fiscal agent.

Uncompahgre Project.—L. J. Foster, project manager, Montrose, Colo.; R. B. Smith, chief clerk; F. D. Helm, fiscal agent.

Yakima Project.—J. L. Lytel, project manager, Yakima, Wash.; R. K. Cunningham, chief clerk; J. C. Gawler, fiscal agent; M. D. Scroggs, superintendent of irrigation, Sunnyside, Wash.; J. S. Moore, superintendent of irrigation, Route 6, Yakima, Wash.; F. T. Crowe, engineer in charge construction Tieton Dam, Rlmrock, Wash.; C. F. Gleason, engineer; V. G. Evans, chief clerk; C. B. Funk, fiscal agent.

Yuma Project.—P. J. Preston, project manager, Yuma, Ariz.; R. M. Priest, superintendent of construction; S. A. McWilliams, engineer, Yuma Mesa Division; E. R. Scheppelmann, chief clerk; E. M. Philebaum, fiscal agent.

INDIAN PROJECTS.

Blackfeet Project.—R. M. Snell, project manager, Browning, Mont. F. H. Shiner, chief clerk and fiscal agent.

Flathead Project.—C. J. Moody, project manager, St. Ignatius, Mont.; S. A. Kerr, engineer in charge construction Hubbard Dam; J. M. Swan, chief clerk; J. P. Siebenlecher, fiscal agent.

Fort Peck Project.—E. L. Decker, acting project manager, Poplar, Mont.; Henry Berryhill, chief clerk and fiscal agent.

The Reclamation Record

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DECEMBER, 1922



ABOVE: BOULDER CANYON ON THE COLORADO RIVER.

BELOW: COLORADO RIVER COMMISSION AND ADVISERS, BISHOP'S LODGE, SANTA FE, NEW MEXICO, NOVEMBER 24, 1922.

Left to right: W. S. Norviel, Commissioner for Arizona; Arthur P. Davis, Director, U. S. Reclamation Service; Ottamar Hamel, Chief Counsel, U. S. Reclamation Service; Herbert Hoover, Secretary of Commerce and Chairman of Commission; Clarence C. Stetson, Executive Secretary of Commission; L. Ward Bannister, Attorney, of Colorado; Richard E. Sloan, Attorney, of Arizona; Edward Clarke, Commissioner for Nevada; C. P. Squires, Commissioner for Nevada; Jas. R. Scrugham, Commissioner for Nevada; William F. Mills, former mayor of Denver; R. E. Caldwell, Commissioner for Utah; W. F. McClure, Commissioner for California; R. F. McKisick, Deputy Attorney General of California; Delph E. Carpenter, Commissioner for Colorado; R. J. Meeker, Assistant State Engineer of Colorado; Stephen B. Davis, Jr., Commissioner for New Mexico; J. S. Nickerson, President, Imperial Irrigation District of California; Frank C. Emerson, Commissioner for Wyoming; Charles May, State Engineer of New Mexico; Merritt C. Mechem, Governor of New Mexico; T. C. Yeager, Attorney for Coachella Valley Irrigation District of California. (See article "The Colorado River Compact," p. 302.)

RECLAMATION LAW NOTES.

By Ottamar Hamele, Chief Counsel, U. S. Reclamation Service.

The Colorado River Compact.

ON November 24, 1922, at Santa Fe, New Mexico, the Colorado River Commission executed a compact providing for an equitable apportionment of the use of the waters of the Colorado River Basin among the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming. The compact becomes effective upon approval by the legislature of each of said States and by the Congress of the United States.

The Colorado River Commission was organized January 26, 1922, at Washington, D. C., and consists of commissioners from said seven States and a representative of the United States. The State Commissioners are as follows: W. S. Norviel, for the State of Arizona, appointed under the act of March 5, 1921 (Sessions Laws Arizona, 1921, p. 53); W. F. McClure for the State of California, appointed under the act of May 12, 1921 (Statutes of California, 1921, p. 85); Delph E. Carpenter, for the State of Colorado, appointed under the act of April 2, 1921 (Session Laws Colorado, 1921, p. 811); J. G. Scrugham, Edward Clarke, and C. P. Squires, for the State of Nevada, appointed under the act of March 21, 1921 (Statutes of Nevada, 1921, p. 190); Stephen B. Davis, jr., for the State of New Mexico, appointed under the act of March 11, 1921 (Laws of New Mexico, 1921, p. 217); R. E. Caldwell, for the State of Utah, appointed under the act of March 14, 1921 (Laws of Utah, 1921, p. 184); and Frank C. Emerson, for the State of Wyoming, appointed under the act of February 22, 1921 (Session Laws, Wyoming, 1921, p. 166). The United States is represented by Herbert Hoover, Secretary of Commerce, appointed under the act of August 19, 1921 (42 Stat. 171). Mr. Hoover is chairman of the commission and Clarence C. Stetson, of the Department of Commerce, is executive secretary.

The Colorado River Commission held a total of 27 executive sessions between January 26, 1922, and November 24, 1922, inclusive, as follows: Seven at Washington, D. C., January 26 to 30 inclusive; 1 at Phoenix, Ariz., March 15; 1 at Denver, Colo., April 1; and 18 at Bishop's Lodge, Santa Fe, N. Mex., November 9 to 24 inclusive.

Public hearings were had before the commission as follows: Phoenix, Ariz., March 15, 16, and 17; Los Angeles, Calif., March 20; Salt Lake City, Utah, March 27 and 28; Grand Junction, Colo., March 29; Denver, Colo., March 31 and April 1; Cheyenne, Wyo., April 2; and Bishop's Lodge, Santa Fe, N. Mex., November 9.

TEXT OF COMPACT.

The following is the full text of the Colorado River compact:

The States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming, having resolved to enter into a compact under the act of the Congress of the United States of America approved August 19, 1921 (42 Stats. 171), and the acts of the legislatures of the said States, have, through their governors, appointed as their commissioners W. S. Norviel for the State of Arizona, W. F. McClure for the State of California, Delph E. Carpenter for the State of Colorado, J. G. Scrugham for the State of Nevada, Stephen B. Davis, jr., for the State of New Mexico, R. E. Caldwell for the State of Utah, Frank C. Emerson for the State of Wyoming, who, after negotiations participated in by Herbert Hoover, appointed by the President as the representative of the United States of America, have agreed upon the following articles:

ARTICLE I.

The major purposes of this compact are to provide for the equitable division and apportionment of the use of the waters of the Colorado River system, to establish the relative importance of different beneficial uses of water, to promote interstate comity, to remove causes of present and future controversies, and to secure the expeditious agricultural and industrial development of the Colorado River Basin, the storage of its waters, and the protection of life and property from floods. To these ends the Colorado River Basin is divided into two basins, and an apportionment of the use of part of the water of the Colorado River system is made to each of them with the provision that further equitable apportionments may be made.

ARTICLE II.

As used in this compact:

(a) The term "Colorado River system" means that portion of the Colorado River and its tributaries within the United States of America.

(b) The term "Colorado River Basin" means all of the drainage area of the Colorado River system and all other territory within the United States of America to which the waters of the Colorado River system shall be beneficially applied.

(c) The term "States of the upper division" means the States of Colorado, New Mexico, Utah, and Wyoming.

(d) The term "States of the lower division" means the States of Arizona, California, and Nevada.

(e) The term "Lee Ferry" means a point in the main stream of the Colorado River 1 mile below the mouth of the Paria River.

(f) The term "upper basin" means those parts of the States of Arizona, Colorado, New Mexico, Utah, and Wyoming within and from which waters

naturally drain into the Colorado River system above Lee Ferry, and also all parts of said States located without the drainage area of the Colorado River system which are now or shall hereafter be beneficially served by waters diverted from the system above Lee Ferry.

(g) The term "lower basin" means those parts of the States of Arizona, California, Nevada, New Mexico, and Utah within and from which waters naturally drain into the Colorado River system below Lee Ferry, and also all parts of said States located without the drainage area of the Colorado River system which are now or shall hereafter be beneficially served by waters diverted from the system below Lee Ferry.

(h) The term "domestic use" shall include the use of water for household, stock, municipal, mining, milling, industrial, and other like purposes, but shall exclude the generation of electrical power.

ARTICLE III.

(a) There is hereby apportioned from the Colorado River system in perpetuity to the upper basin and to the lower basin, respectively, the exclusive beneficial consumptive use of 7,500,000 acre-feet of water per annum, which shall include all water necessary for the supply of any rights which may now exist.

(b) In addition to the apportionment in paragraph (a) the lower basin is hereby given the right to increase its beneficial consumptive use of such waters by 1,000,000 acre-feet per annum.

(c) If, as a matter of international comity, the United States of America shall hereafter recognize in the United States of Mexico any right to the use of any waters of the Colorado River system, such waters shall be supplied first from the waters which are surplus over and above the aggregate of the quantities specified in paragraphs (a) and (b); and if such surplus shall prove insufficient for this purpose, then the burden of such deficiency shall be equally borne by the upper basin and the lower basin, and whenever necessary the States of the upper division shall deliver at Lee Ferry water to supply one-half of the deficiency so recognized in addition to that provided in paragraph (d).

(d) The States of the upper division will not cause the flow of the river at Lee Ferry to be depleted below an aggregate of 75,000,000 acre-feet for any period of 10 consecutive years reckoned in continuing progressive series beginning with the 1st day of October next succeeding the ratification of this compact.

(e) The States of the upper division shall not withhold water and the States of the lower division shall not require the delivery of water which can not reasonably be applied to domestic and agricultural uses.

(f) Further equitable apportionment of the beneficial uses of the waters of the Colorado River system unapportioned by paragraphs (a), (b), and (c) may be made in the manner provided in paragraph (g) at any time after October 1, 1963, if and when either basin shall have reached its total beneficial consumptive use as set out in paragraphs (a) and (b).

(g) In the event of a desire for a further apportionment as provided in paragraph (f) any two signatory States, acting through their governors, may give joint notice of such desire to the governors of the other signatory States and to the President of the United States of America, and it shall be the duty of the governors of the signatory States and of the Presi-

dent of the United States of America forthwith to appoint representatives, whose duty it shall be to divide and apportion equitably between the upper basin and lower basin the beneficial use of the unapportioned water of the Colorado River system as mentioned in paragraph (f), subject to the legislative ratification of the signatory States and the Congress of the United States of America.

ARTICLE IV.

(a) Inasmuch as the Colorado River has ceased to be navigable for commerce and the reservation of its waters for navigation would seriously limit the development of its basin, the use of its waters for purposes of navigation shall be subservient to the uses of such waters for domestic, agricultural, and power purposes. If the Congress shall not consent to this paragraph, the other provisions of this compact shall nevertheless remain binding.

(b) Subject to the provisions of this compact, water of the Colorado River system may be impounded and used for the generation of electrical power, but such impounding and use shall be subservient to the use and consumption of such water for agricultural and domestic purposes and shall not interfere with or prevent use for such dominant purposes.

(c) The provisions of this article shall not apply to or interfere with the regulation and control by any State within its boundaries of the appropriation, use, and distribution of water.

ARTICLE V.

The chief official of each signatory State charged with the administration of water rights together with the director of the United States Reclamation Service and the director of the United States Geological Survey shall cooperate, ex officio:

(a) To promote the systematic determination and coordination of the facts as to flow, appropriation, consumption, and use of water in the Colorado River Basin, and the interchange of available information in such matters.

(b) To secure the ascertainment and publication of the annual flow of the Colorado River at Lee Ferry.

(c) To perform such other duties as may be assigned by mutual consent of the signatories from time to time.

ARTICLE VI.

Should any claim or controversy arise between any two or more of the signatory States (a) with respect to the waters of the Colorado River system not covered by the terms of this compact, (b) over the meaning or performance of any of the terms of this compact, (c) as to the allocation of the burdens incident to the performance of any article of this compact or the delivery of waters as herein provided, (d) as to the construction or operation of works within the Colorado River Basin to be situated in two or more States, or to be constructed in one State for the benefit of another State, or (e) as to the diversion of water in one State for the benefit of another State, the governors of the States affected, upon the request of one of them, shall forthwith appoint commissioners with power to consider and adjust such claim or controversy, subject to ratification by the legislatures of the States so affected.

Nothing herein contained shall prevent the adjustment of any such claim or controversy by any present

method or by direct future legislative action of the interested States.

ARTICLE VII.

Nothing in this compact shall be construed as affecting the obligations of the United States of America to Indian tribes.

ARTICLE VIII.

Present perfected rights to the beneficial use of waters of the Colorado River system are unimpaired by this compact. Whenever storage capacity of 5,000,000 acre-feet shall have been provided on the main Colorado River within or for the benefit of the lower basin, then claims of such rights, if any, by appropriators or users of water in the lower basin against appropriators or users of water in the upper basin shall attach to and be satisfied from water that may be stored not in conflict with Article III.

All other rights to beneficial use of waters of the Colorado River system shall be satisfied solely from the water apportioned to that basin in which they are situate.

ARTICLE IX.

Nothing in this compact shall be construed to limit or prevent any State from instituting or maintaining any action or proceeding, legal or equitable, for the protection of any right under this compact or the enforcement of any of its provisions.

ARTICLE X.

This compact may be terminated at any time by the unanimous agreement of the signatory States. In the event of such termination all rights established under it shall continue unimpaired.

ARTICLE XI.

This compact shall become binding and obligatory when it shall have been approved by the legislatures of each of the signatory States and by the Congress of the United States. Notice of approval by the legislatures shall be given by the governor of each signatory State to the governors of the other signatory States and to the President of the United States, and the President of the United States is requested to give notice to the governors of the signatory States of approval by the Congress of the United States.

IN WITNESS WHEREOF, the commissioners have signed this compact in a single original, which shall be deposited in the archives of the Department of State of the United States of America and of which a duly certified copy shall be forwarded to the governor of each of the signatory States.

DONE at the CITY of Santa Fe, N. Mex., this 24th day of November, A. D. 1922.

W. S. NORVIEL.
W. F. MCCLURE.
DELPH E. CARPENTER.
J. G. SCRUGHAM.
STEPHEN B. DAVIS, JR.
R. E. CALDWELL.
FRANK C. EMERSON.

Approved:

HERBERT HOOVER.

RESOLUTION CONCERNING FLOOD CONTROL.

The Colorado River Commission on November 24, 1922, adopted the following resolution concerning flood control:

The members of the Colorado River Commission have had constantly before them the great menace by annual floods to the lives and property of the people of the Imperial and Palo Verde Valleys in California, and the Yuma Valley in Arizona, and the anxiety of their thousands of citizens.

Therefore, they earnestly recommend and urge the early construction of works in the Colorado River to control the floods and permanently avoid the menace, such construction to be made subject to the Colorado River Compact.

COMMENT BY CHAIRMAN HOOVER.

Chairman Herbert Hoover, of the Colorado River Commission, commented as follows upon the work of the commission:

The big thing about the Colorado River compact is that it breaks the blockade on development of the whole river. It allows us all to get ahead with river development and with flood protection to the Imperial and Yuma Valleys.

The worst thing about the compact is that it will destroy much oratory. It makes for growing spuds and not for glowing speech.

One can get great emotion over conflict and quarrel, but there is no great oratory about the fact that the northern basin is separated from the southern basin by a thousand miles of barren canyon; that the agriculture and economic life of the two basins are wholly different, and that the logical thing is to divide the water between them so they can make homes instead of defend injunctions.

Nor can one make great oratory out of the fact that there is ample water and to spare after the apportionment of enough water to each basin in perpetuity to cover all of the present uses plus all of the known feasible projects, plus 30 per cent for good measure, then holding in reserve 30 per cent for 40 years to see where it is most needed. There is nothing sensational about a compact that leaves all question of Mexican rights to water to the State Department, which is the only organ of the American people which has any right to deal with it. There is nothing especially romantic about the provisions in the compact for complete priority of agriculture over power forever in the use of water of this river.

Yet, behind all the precise and commonplace language of this compact lies the greatness and romance of the West, the building of a million more homes out under the blue sky in security and good will.

The compact has a side interest, for with the exception of two other cases, and these only between two States, this compact marks the first time that a considerable number of States have settled fundamental interstate rights by process of treaty instead of resort to the Supreme Court.

COMMENT BY DIRECTOR DAVIS.

Director Arthur P. Davis, of the United States Reclamation Service, made the following comment:

The unanimous agreement by the Colorado River Commission upon the details of a compact for the division of the uses and protection of rights to the use of the waters of the Colorado River and its tributaries is a signal victory for those qualities and impulses which distinguish the civilized from the savage. It will obviate the delay and the acrimonious litigations which a year ago seemed imminent and has cleared the way for the provision of flood control

and irrigation storage, urgently needed and indispensable to further development in the Colorado River Basin.

The original contentions of the seven States were so far apart that an agreement seemed hopeless. But a discussion of the various needs led to a closer acquaintance with the facts and the various points of view, and the conclusions may be said to award each claimant more than he expected in view of the original contentions.

The satisfactory settlement of all these disputes at small expense within a year after the organization of the commission is in strong contrast to the alternative of litigation. The recent decision of the Supreme Court in the Wyoming-Colorado case was rendered about 11 years after its inception, and dealt only with a single controversy in a small stream basin. The Colorado Basin lies in seven States, in which thousands of users are diverting its waters. Its development involved some of the largest and most difficult engineering problems ever attempted and a multitude of complicated interests and possible disputes, which have been settled within 11 months instead of 11 years.

All good citizens should rejoice in this substitution of reason and progress for conflict and stagnation.

This happy result is due largely to the broad-

minded attitude of the members of the commission, and especially to the patience, tact, and diplomatic ability of the chairman of the commission, Hon. Herbert Hoover.

The natural flow of the Colorado River averages nearly 20,000,000 acre-feet per annum. Of this about one-third now is used, and this includes the low-water flow in the lower basin, which can not further develop safely without storage. The present users in the lower basin take about 3,700,000 acre-feet. The compact awards this portion of the basin a total annual flow of 8,500,000 acre-feet, or more than double its present needs, and sufficient to develop all feasible projects and some of doubtful feasibility. The upper basin is awarded 7,500,000 acre-feet, which also is more than double its present needs and sufficient to serve nearly 3,000,000 acres additional, which will be sufficient for all feasible projects and some of doubtful feasibility.

If this water is not consumed in irrigation, it will run down through the canyons for use below. There remains an unapportioned quantity of over 4,000,000 acre-feet for future division as unforeseen needs may appear. Such a further division is provided for in the compact. Thus, both basins are provided for fully, their present development protected, and their future development unhampered by water disputes.

THE RECLAMATION MAIL BAG.

J. D. Remsberg Speaks Up for the Minidoka Project.

RUPERT, IDAHO, *December 2, 1922.*

UNITED STATES RECLAMATION SERVICE AND MINIDOKA IRRIGATION DISTRICT:

During the past year or more so much has been said and printed regarding the financial condition of the farmers on the Minidoka project that there are no doubt a great many people not in possession of all the facts that have been misled to believe that the fault lies within the land itself rather than with the individuals. Such impressions have a tendency to create in the minds of such people the belief that a farmer can not make a living on this land, and I feel that something should be done to place before these people the facts as they exist.

This project, like all other sections of the entire country, is going through a process of readjustment brought on by the inflated values following the war, and while a great many of our farmers are losing out, the fault lies not in the land itself but partly in the fact that the land was purchased on a "shoe string" at a price far in excess of what it should have been, and the purchaser now finds himself in the position of being unable to meet his interest and a portion of his large deferred principal payment when coupled with his annual operating expense.

For 36 years I was a resident of Allen County, Kans., and for 15 years of that time owned and operated a farm in that county. During 9 years of the latter time I was cashier of a bank in Allen County, Kans. Business reverses there worse than broke me, and in the spring of 1912, when I moved to the north side division of the Minidoka project, I was in debt over \$12,000. When I came to the project I rented a tract of 100 acres northeast of Rupert, part of which was yet in the rough, and started to work.

I had no cash whatever, because a bill of \$35 on account of excess of freight on my household goods and three cows which I brought with me, took the last money I had. Shortly after I reached here my wife traded her property in Kansas for a third interest in an 80-acre tract about a mile west of Rupert, which tract was valued at \$6,000. In 1916 I purchased for \$12,000 a 100-acre tract adjoining the same size tract which I was then renting and on which I am still living. At that time I still had no available cash; in fact I borrowed \$500 with which to make the initial payment on the \$12,000 place. I was able to repay this and meet the payments as they came due as well as liquidate my indebtedness in the East. The season of 1918 was an unusually successful one for all farmers, due to high prices received for their products, my crop from the 280 acres bringing a gross income of \$18,000. In January, 1919, I entered into a contract for the purchase of the 100-acre tract known as my home place, and which I had rented since 1912, for a consideration of \$20,000. To-day there is an indebtedness of \$14,500 against the 280 acres, and my interest, taxes, and water-right charges are all paid to date. In other words, I have been able to pay off the \$12,000 indebtedness which followed me from Kansas, and \$21,500 of the original purchase price of the land I now own. To this, of course, must be added interest, taxes, and water charges each year, together with the expense of keeping my two boys and one girl in high school and university. I am also proud of the fact that I am able to carry a \$5,000 endowment life-insurance policy on the lives of each of my boys, as well as \$9,000 on my own life.

Some people will say that I have had unusual luck, but I admit this only with respect to the fact that

we have had little or no sickness in the family since I moved to Idaho. Everything that I have acquired is due to hard work, and the wonderful combination of soil, water, and climate with which we are favored. I have produced 11 annual crops on this project of maximum proportions and I have never yet had a year in which I have lost money.

It is my own personal opinion that the continued agitation for the postponement of water-right charges has had a demoralizing effect upon the project as a whole; while I am very much in favor of anything that will assist unfortunate and deserving men, at the same time I can not help but honestly feel that the promiscuous granting of extensions to those who are able to pay their charges would simply be placing a stumbling block in the path of their own progress and would be detrimental to themselves and the project as a whole. I am certainly in sympathy with any deserving man who is on the verge of losing his home and my whole heart is back of any move that will assist him to get back on his feet. Some of these men undoubtedly could have paid their charges during the years of high prices, but in spite of that fact

if we can help him to pull through we should do so.

I am very much in favor of the move being made to bring new people into the country and shall be glad to do what I can to assist in the movement.

Summing up conditions in general, I would say that the inflated land values of 1918, 1919, and 1920, the purchasing of land on a "shoe string" during those years, and the exorbitant freight rates which we are forced to pay have contributed very largely to the condition of our farmers to-day.

But as a place to live and to produce maximum crops, and in ordinary years to make money, I still maintain that the Minidoka project has no superior. We have the best of schools, the best of roads, the best of water rights, and the best of lands supplied with the best electric service, in a climate equal to the best in the United States.

My faith in the Minidoka project is as unshaken as it was in 1918-1920, and I hope you will do all in your power to place the actual facts in the minds of those who doubt its future.

Very truly yours,

J. D. REMSBERG

SHORT STORIES OF SUCCESSFUL SETTLERS.

Gathered from the Project Press and People.

By C. J. Blanchard, Statistician.

ONE of the real adventures of our tour of the Black Hills region was a brief visit to a part of the White River Badlands near Scenic. We left Rapid City after supper and headed southeast through a charming valley—a picture of prosperity. The Black Hills were enveloped in somber clouds, portents of a summer storm; lightning pierced the black curtain creeping down the slopes, and the rumble of distant thunder followed each vivid flash. Harney Peak and the jagged pinnacles of lesser height were obliterated save when illuminated by the zigzag darts. The spectacle was thrilling and impressive.

As we sped along over the fine highway it was observed that we were in shadow, although the valley on each side was in bright sunshine. Our curiosity was excited, and we stopped the car to ascertain the cause. Directly overhead was a heavy black ribbon of cloud, scarcely wider than the road, extending in a straight line from the valley clear to the hills and cutting off the sunlight. From this cloud a fine rain began to descend, just laying the dust. It took us an hour to get from beneath this cloud, but as soon as we did the shower ceased and we had dry roads to the end of the journey. A shower confined to a strip 20 miles long and not more than 100 feet wide struck us as something rather unusual.

Scenic, the northwestern outpost of the Badlands, is located on a syncline of the Great Plains—a treeless and unattractive region, its great expanse broken

on the south by the steep front of a line of hills, their northern faces deeply gashed by canyons.

The atmosphere of the frontier clings to Scenic. It is a cowman's town, but the people were most hospitable, and we were quite comfortably lodged for the night. Early next morning we started for the highest of the hills, and following a prairie road finally reached the foot of Sheep Mountain, which rises about 3,000 feet above the Plains. The ascent of the mountain was attained with difficulty by the auto, and was by no means easy for the passengers who made it on foot. We climbed up through a narrow defile, winding in and out. It is a pass created by the washings of rains, assisted here and there by the labor of a ranchman whose home is on the top of the hill. Once on top, our journey was easy and swift, as we traveled over a carpet of thick grass strewn with flowers of many varieties. After a couple of miles of this the driver brought us with a sharp turn to the rim of the mountain.

Here we viewed one of the amazing examples of nature's tireless industry. From where we stood the earth seemed to fall away in a sheer drop of a thousand feet. Rising out of the depths were innumerable delicately etched pinnacles, minarets, and towers. On distant terraces we glimpsed the ruins of ancient temples and magnificent castles. Close to the cliffs on which we stood the sculpturing and carving were intricate and beautiful. The general color

scheme is soft gray, with thin bands of pink and yellow and brown.

We made a complete circuit of the flat top of Sheep Mountain, crawled out on narrow ledges bridging deep chasms, and wandered about in narrow canyons between towering walls. The formations of the Badlands permit us to distinguish three eras in the world's history, Paleozoic, Mesozoic, and Cenozoic. In the last era, and in the epoch described as Tertiary, the principal rock formations were laid down. Previous to that era the North American Continent was divided by a great sea extending from the Arctic Ocean to the Gulf of Mexico, and covering parts of Texas, New Mexico, Utah, Colorado, Idaho, and Montana. At the same time the Black Hills region was largely covered by a wide, shallow lake which swarmed with myriads of marine organisms. As time passed the lake changed from salt to fresh water, perhaps as a result of the seismic disturbances occurring during the interval, which produced the Rocky Mountains and their isolated orphans, the Black Hills. Then began a period of fascinating interest to the student: The great sea dries up and marshy lands replace it; under an almost tropical climate, luxuriant vegetation abounds; gigantic forests cover wide areas; broad plains covered with rich grasses appear. Suddenly the earth, long silent, awakes to teeming mammalian life. Near the lakes and along the valleys of streams great herds of rhinoceroses gather to feed on the rank vegetation. On the prairies the three-toed horses, fleet as deer, grazed, fearless of bit or spur. Predacious dogs tracked their prey, and ferocious saber-toothed tigers stalked the six-horned deer, or dared the huger herbivores, when hunger-driven.

The autocrats of this wonderful hippodrome were the Titanotheres, as large as the African elephant, but more nearly resembling the rhinoceros. There were also the Oredonts, with head of a camel and frame of a pig; humpless camels with padless feet, monster turtles, and an infinite variety of other types and forms.

Man was not present, and perhaps it was well he was not, as his chance of long survival would have been slight.

This page, torn from the history of tired old mother earth reads like a drugged dream of De Quincy. You wonder where we find cold facts to substantiate its truth. How do we know that all these wonderful and strange animals existed here in such countless numbers? The geologist smiles at our question, and takes us to the spot where a tiny stream has worn its channel through the soft clay. From the bank protrudes a massive bone 4 feet long and 2 feet thick. "This," he says, "is the skull of a Titanotheres. In life it was 9 feet high and weighed 2 tons. You can see one restored to natural form in the Museum at Washington or in New York."

The Badlands are literally strewn with the remains of these and other animals of that long ago. Nature tucked them away in clefts and crannies, and then buried them deeply with the deposit of silt-laden streams. Now she is uncovering them in order to unlock the mystery of ages. These marvelous pinnacles and towers, these crumbling temples and colossal obelisks are all the work of her children—the wind, frost, and rain.

This marvelous amphitheater is their creation, and the materials excavated have been carried far away to build up the wide plains.

This prosaic and matter-of-fact explanation does not satisfy. The mystery and charm which prevails here are not lost to us by this elucidation of the meaning of the picture. It can never take from us the pleasing thought that these delicately carved pinnacles, leaping at us from the depths, these massive towers, temples, castles, and palaces, and the myriads of other symmetrical edifices glowing in the red-rose flame of the sunset represent only the masterpieces of ancient divinities of a Titanic underworld.

After a day of wanderings in a labyrinth of cathedrals, through aisles where the sunlight has never penetrated, climbing into castles of primeval monarchs, whose lofty towers are now the eyries of the eagles, and whose halls are the haunts of the wolf, you are in no mind to accept the scientific phrase making of a geologist who attempts to interpret these wonders for you.

Here is a phenomenon which baffles description. It is inviting your personal study and observation.

WHAT OTHERS HAVE DONE YOU CAN DO.

Salt River project, Arizona.—The last two weeks in November and the first two in December were busy ones for the Arizona Citrus Growers' Association. They took advantage of the fact that Arizona fruit ripens earlier than that of California, and rushed their fancy oranges to the eastern market.

To those who are not familiar with the conditions down there and are not acquainted with the fine quality of the Salt River Valley fruit it will strike them as anomalous that Arizona should find her best market for grapefruit in California. Such, however, is the case, and there are two reasons for such shipments. First, earlier ripening; and, second, a better quality of the fruit.

Citrus growing in the valley, according to men who have studied its development, offers increasing opportunities. One man who has a sizeable grove remarked recently that with the exception of one or two seasons he had profited better than 12 per cent and sometimes as high as 20 per cent yearly on his investment. Some idea of the volume of the shipments leaving Phoenix daily can be gleaned from the fact that a freight car carries from 400 to 420 boxes of fruit, and four cars is the daily average.

There is no trouble this year about getting pickers. Men looking for jobs on the citrus farms are dropping off every train. Practically all the pickers being employed this year are white men.

The section surrounding Chandler has always been noted for diversity of agriculture. Most farmers thereabouts are operating so as to have something to market all the time. Thanksgiving markets found these farmers ready with a lot of fine turkeys, some 2,000 of which were absorbed in southern Arizona. They grow them large down there, as evidenced by the record of H. A. Pettard, who marketed 109 birds, weighing an average of 17 pounds each. The average dressed weight of the turkeys sold this season was 14 pounds. Because of the extra careful manner in which the birds were packed the prices ruled high and the demand was excellent.

Chandler's canned jams are making a hit. In the past six months consumption has increased 30 per cent. A recent order of 400 cases from Miami and another of 500 cases from Bowie were received. The cannery puts up a fine line of canned plum, fig, apricot, and peach jams, and the increase of business encourages the hope that ultimately it will absorb all the surplus fruits of the valley farms.

Orland project, California.—In the midst of the almost nation-wide stagnation in land selling, it is exceedingly gratifying to report that on the Orland—the project of no regrets—expert farmers are buying Orland's acres. The Idaho settlement on the project was augmented recently by a successful farmer from the Twin Falls section, John J. Fox, who is planning to set out some 20 acres to prunes and apricots. A resident of Oakland during the same week bought 40 acres to be planted to vines and trees. It is estimated that the acreage planted to trees this year will be double that of last. The acreages of assured plantings at this writing are as follows: Apricots, 566; Kadata figs, 100; Mexican figs, 11; peaches, 89; plums, 16; and grapes, 39.

Diversity characterizes Orland's agriculture; marketing organizations are functioning successfully; a large part of the farmer's food is grown on his farm and not bought at the grocery. In other words, the Orlander is farming with his head. When you read of one little community like this marketing 64,401 pounds of turkeys and 37,000 pounds of chickens, ducks, and geese as a single day's shipment you appreciate that here is a live class of farmers. Of course it is a community in which contentment prevails.

The important fact to be remembered in this connection is that the Orland project, when the Government first undertook its reclamation, was a worn-out wheat-growing district. Its sandy and gravelly soils gave little hint of the amazing fertility which has since been shown. Orland folks have been strong in their faith in their project. There has existed here from the first a splendid community spirit, and their mutuality of interests to-day is reflected in well-organized cooperative associations, creameries, marketing organizations, and the like. While most of our farming communities are passing through a critical stage Orland is cheerful and forward looking. The farmers here have made good, and with fewer advantages in soil or location than many other sections which are in sore straits just now.

Orland's almond crop just sold brought about \$40,000 to the growers.

Uncompahgre project, Colorado.—If first prizes were eagle's feathers, our good friend John Howell, of Olathe, would have a war bonnet that would be the envy of any Indian warrior. First prizes seem just naturally to gravitate to him every time he puts an

exhibit in a show. He has returned to the valley recently with two more firsts for hard red winter wheat and white spring wheat, won at the International Stock Show in Chicago.

The Montrose and Delta County poultry breeders are making progress. At the recent poultry show held in Montrose Armory more than 300 birds were exhibited. Great interest was shown by the farmers, and much benefit was derived from the exhibit. The valley climate is first class for this industry.

Boise project, Idaho.—Boise the beautiful is in the throes of a big drive to raise a guaranty of \$400,000 which will secure it a seat among the mighty by putting it on the main line of a transcontinental railway. Of course the citizens are going to raise the money. Boise has too long suffered from the handicap of remoteness and isolation due to being on a branch. Their slogan in this campaign for funds is: "Drive your spike!" Our prediction is that before another year rolls around Boise will be on the main line, Omaha to Portland.

It is estimated that the gentle dairy cow and the lowly hen added \$4,000,000 this year to the capital of Boise Valley farmers. In Nampa alone the daily milk check account runs to \$5,000. Caldwell, the headquarters for the poultry industry, estimates the annual revenue as \$2,000,000, the greater part of which is a side line of the farm production.

Minidoka project, Idaho.—One week's shipment of turkeys from Rupert station totaled \$96 and brought the growers \$3,066.96; the average price was 26 cents per pound. During the same period 1,104 chickens were sold, at an average price of 11 cents per pound. A rather poor assortment of dressed turkeys sold in Washington during Thanksgiving week at prices ranging from 60 to 75 cents per pound. Something of a spread between the producer and the consumer—eh, what? Wonder who got it!

The directors of the Minidoka irrigation district are working out plans for a selling organization to handle excess and surplus lands of the farmers, in order to secure a lot of practical farmers. The organization is nonprofit making, and its aim is to assist the chap whose holdings are a burden to him and at the same time to protect the newcomer from exploitation. The plan is commendable, and if the landowners will back it up wholeheartedly it will be supported by the department. Success is not possible, however, unless fair dealing is assured the newcomer. Land prices will have to be made attractive and the terms as easy as possible. The disastrous aftermath of inflated valuation due to abnormal war prices is still felt. Dreams of great profits in quick turnover of lands must be forgotten; prices must be based on actual returns from land during normal years. When Minidoka farmers who have lands to sell come to realize these facts, and price their lands right, we look for a return of selling and the coming of real farmers. The project has so many things to recommend it to practical farmers that we are sanguine a restoration of normal times is not far off.

The granges have given their unqualified indorsement of the plan proposed by the irrigation district to bring new settlers to the project, and similar approval has been given by the Rotary Club and chamber of commerce. A nonprofit-making organization is being formed, comprised of the landowners whose property is to be listed for sale. Each member will deposit \$2 for initiatory expenses. The plan of list-

ing is as follows: First, the owner submits a description of the land and improvements, copy of abstract, and quotes the price and terms; second, an appraisal committee views the property, and if satisfied that price and terms are right, accepts the listing, with an option for one year; if not satisfied with the price, no listing is accepted; third, a commission of 2½ per cent will be withheld from the purchase price for the operating expenses of the organization. A special drive is planned for a class of practical dairy farmers.

Undoubtedly many changes in ownership must take place before the maximum of crop yields will be reached. It is also true that many of the farmers who will stay must change their methods and adopt those which experience has shown are successful. On most of our projects investigation shows that the studies and experiments of experts and the examples of successful farmers are not taken advantage of by those who are having the hardest struggle to get along. In the face of demonstrations proving beyond question that these farmers are growing crops which put their balance in the red, the bad practices are continued. Hundreds of these people have neither cow, pig, nor hen on the place. Many do not even have a garden. The pile of tin cans in the corner of the fence indicates a big grocery bill and is proof of poor nourishment for the family. When it is shown that the poultry products on a project can be made to carry the debt to the Government, why do not more farmers have hens? When the milk checks on a project run up to \$2,000,000 a year, or four times the annual construction charge, why don't the farmers keep cows? You tell, we can't.

The Minidoka Potato Growers' Association, notwithstanding the glutted condition of the market, has demonstrated its ability to get all there was in it for its members. While many communities report no sales at any price, and complain of shortage of cars and other difficulties, this association has continued to market a lot of spuds. Although the prices are nothing to brag of, the fact that they are able to sell at all has been of great benefit to the farmers who faced the prospect of leaving their spuds undug. The returns to the farmers have been small, prices ranging from 74 cents to 28 cents per hundred: Oklahoma, Texas, Arkansas, and Tennessee the principal markets. The quality of the potatoes this year was of the best.

We beg to add that an inferior grade of potatoes is being sold to Washingtonians at \$1.70 per hundred on "cash and carry" system.

Lower Yellowstone project, Montana-North Dakota.—A concrete example of the value of row crops on the Lower Yellowstone project is furnished by the 1921 crop report of Mr. C. A. Brooks, a farmer in the Midway district. Mr. Brooks operates a well-balanced farm. His stock consists of 8 horses, 19 dairy cows, 9 hogs, and about 100 chickens. He cultivates about 119 acres, with additional 12 acres in pasture and 15 acres in native hay. The 119 acres were in various crops, such as alfalfa, barley, beans, sugar beets, corn, onions, potatoes, cabbages, melons, and garden, and produced a gross return of \$6,042, or \$50.77 per acre. His row crops occupied 68 acres, or more than half of the land cultivated, and these crops had a gross value of \$5,483, or \$80.64 per acre. From a single acre in cabbages, Mr. Brooks sold \$1,000 worth. An acre of onions yielded him \$800, and an acre of melons \$200.

In the season of 1921 only 7 per cent of the acreage of the project was in row crops. It is quite evident that the farming methods as now practiced on the project must undergo a radical change before permanent prosperity for the farmers is to be expected.

The plans adopted by Mr. Brooks should be carefully studied this winter by others on the project, and farmers should cut loose from practices which sad experience has demonstrated are heading them toward bankruptcy. The Brooks system calls for a lot of hard work, long hours, and careful irrigation—but it pays.

Milk River project, Montana.—A few years ago anyone daring enough to suggest corn as a profitable crop in eastern Montana would have been laughed out of the State. A former locomotive engineer on the Huntley project, of an inquisitive turn of mind, planted a small plot in corn and succeeded in maturing a few ears; he carefully selected his seed, the original stock coming from northern Minnesota, and at last obtained a quickly maturing type. He won prizes all over the State and did a profitable business in selling seed. His success has transformed a large acreage of Montana from wheat to corn fields, and corn shows in the State are now annual affairs, largely attended. One of the most successful of these has just closed at Malta, on the Milk River.

The introduction of corn culture on this project is due to the wisdom of the State commissioners, who a few years ago when called upon to furnish seed loans to impoverished farmers insisted on the planting of a portion of the acreage in corn. The result was most satisfactory, and corn seems destined to replace wheat as the staple cereal in that region.

At the recent show were 4,800 ears of corn in 400 exhibits. The favorite variety was Northwestern Dent, with White Flint as the nearest rival. Phillips County led all others in number of exhibits, especially in corn. E. G. Miller of Harlem was awarded sweepstakes honors, with H. J. Rocek and Carl Berg of Malta just behind. An exceptional fine showing of potatoes was made by the exhibitors. Among the prize winners were exhibitors from the Lower Yellowstone and Fort Peck (Indian) projects.

Chinook was selected as the location of the next annual exhibition.

Sun River project, Montana.—Summing up the possibilities of bee culture on the Sun River project, L. E. Baldwin, a successful farmer, recently said:

"In the course of five years or so this project could be shipping a car of honey every day for 30 days, on the basis of rotated crops on the 40,000 acres of the Greenfield bench and 10,000 acres on Fort Shaw division. In this region 2 acres affords sufficient range for a colony of bees.

"The productive period is the long summer days from June 1 to September 1. Bees produce perhaps on an average of 100 pounds per season per colony. In the territory mentioned there might be produced 1,250,000 pounds of honey at a value of 8 cents a pound.

"Making a larger picture and taking in the Valier project with its 80,000 acres, the Blackfoot project, with its 118,000 acres, the Milk River project with its 190,000 acres, and the Bynum project with 75,000 acres, we would then have 383,000 acres. We would then get into such figures as 120,000 colonies of bees producing 12,000,000 pounds of honey, and one car

could be shipped on 300 days of each year. "This is not visionary, because in Georgia we have one owner producing 1,000,000 pounds of honey in a season. Another in Cuba produces 2,000 barrels.

"Our faith is justified because Montana ranks at the top in the production of honey. We produce more honey per colony than does California with all its sunshine and flowers, and our principal problem is to get our bees through the winter safely, all of which is now being accomplished in a satisfactory way by the use of the so-called Government quadruple outdoor packing case.

"One of my colonies produced 12 pounds of honey in a single day and another colony produced 420 pounds of honey in a season. So far all of this has been accomplished without any concerted action for the sale of the product or advertising to create a demand. Each American consumes 100 pounds of sweet per capita per year. Herein is the opportunity, therefore, for development and profit in the bee industry."

Newlands project, Nevada.—Nearly three times as many turkeys were grown in the Newlands project this year as were produced in 1921, according to a census compiled by the reclamation office at Fallon. A survey of the project this fall showed that farmers have raised 12,200 birds. The turkey population of the project last year was 4,800. The yield this year had previously been estimated from 125,000 pounds to as high as 250,000 pounds.

On an average of 12 pounds to the bird the weight of this year's crop is placed at 150,000 pounds. This will return approximately \$60,000 to the growers here. The price received during the Thanksgiving marketing season averaged a little over 40 cents a pound at a variation between 40 and 42 cents. Some sales at a higher price for choice flocks were reported.

"At this rate of increase and judging from what farmers here say as to their expectations of increasing the size of their flocks next year, turkey raising promises to become the second most important industry in this part of Nevada," said L. E. Cline, Federal agriculturalist stationed at Fallon. "Turkey raising is something that requires little capital with which to make a start. That is a most important item, as it enables homesteaders to launch into a paying line of work—homesteaders and others who can not finance the purchase of a dairy herd and equipment."

Rio Grande project, New Mexico-Texas.—El Paso Valley residents have started a drive to raise \$10,000 for the erection of a valley church and community center, to be erected on the land of T. D. Porcher, about 8 miles from the city on the main country road.

The building, as being planned, will consist of three units—a chapel, community hall, and children's room. The community hall will have a seating capacity of 300 and will be equipped with a large stage with dressing rooms, entertainment rooms for men and women, and a motion picture machine. The hall will be used for community gatherings, dramatics, valley exhibits, and similar entertainments.

Church services and Sunday school will be held in the chapel, which will have a seating capacity of at least 125. The children's room will be equipped with entertainment features and will contain a branch library with a large reading room.

El Paso Chamber of Commerce is evincing a commendable interest in the question of colonizing the vacant lands of the lower valley. Plans are being

worked out by a committee to secure options on long time and easy terms before engaging in publicity work. The greatest drawback in the past has been the high valuations due to large speculative holdings. It is encouraging to note the activity of this powerful organization in initiating a movement which, if successfully carried out, will add millions to the valley's wealth. "The remarks of W. L. Tovey, chairman of the board, are to the point:

"Before any attempt is made to settle valley lands with successful farmers, an organization to handle this movement should be perfected and the prices on the lands should be right."

Umatilla project, Oregon.—Hermiston boys put the project on the map in style at the Pacific International Live Stock Show in Portland. Ten prizes in all were carried home by the boys with their champion pigs.

In the single pig contest William Waugaman's Duocos captured the blue ribbon, or first prize, and James Waugaman took second prize, the red ribbon. The Waugaman boys won in addition to these two fourth prizes and one fifth.

Tilford Stillings showed the judges that real Poland Chinas come from this section and they agreed by awarding him first, second, third, fourth, and fifth prizes, a clean sweep.

Belle Fourche project, South Dakota.—Newell is rapidly taking its place as the principal poultry center of western South Dakota, if, indeed, it has not already attained that record.

Since November 1 a total of 13,500 pounds of chickens, ducks, geese, and turkeys have gone out from this station to the eastern and western market centers. The bulk of the shipments were consigned to dealers in Chicago, Casper, Wyo., and in the Black Hills.

It would be interesting to know the total figures for the past year of poultry marketed here for local consumption and for shipment to other points. The figures given of November shipments indicate that the amount would be enormous, and that poultry raising is not the least important of the varied industries carried on in the project.

Yakima project, Washington.—Cucumber growers in the Yakima Valley raising crops for the Libby, McNeill & Libby cannery this season received \$11,395 for their products raised on 85 acres, an average of \$150 an acre. The growers raised 321 tons, or an average of 3.7 tons an acre, for which \$75 a ton was paid for No. 1, \$40 for No. 2, and \$15 for No. 3 grades with \$15 a ton for nubs and crooks.

F. A. Chott, of Tietonview, had the highest return from a single acre, getting \$502 for 10.8 tons. Charles Stewart, of Wapato, had the highest yield per acre, raising 7.9 tons from half an acre. Other successful growers were S. E. Culver, of Naches; O. T. Eagan, of Wapato; H. E. Arnin, of Tieton; T. H. Bacon, of Wapato; George Dochow, of Naches Heights; Carl Mausperger, of Wiley City; Thomas Wilson, of Cottonwood; and W. S. Wilson of the same vicinity.

Higgins and Kludas, north of Grandview, set a record of 600 crates of cants to an acre of ground. In ordinary years this would have been a profitable piece of land. As it was the cants went for 50 cents a crate, so the return was not to be sneezed at.

Shoshone project, Wyoming.—The little city of Powell presented an interesting picture during the week before Thanksgiving. It was turkey town, sure enough. Four thousand plump birds, tapered off perfectly for epicures in Butte, Omaha, and else-

where, were sacrificed, plucked, packed, and started forth on their journey, which ended at the groaning tables of the hungry city folks. Buyers were on hand from several points, and their comment on the quality of the gobbler product of the project should encourage the farmers to add to their flocks next year. The average price was around \$3 per bird. Approximately \$12,000 was paid out by the buyers for Thanksgiving. At least as much more is likely to be paid at Christmas.

There seems no good reason why the industry should not be several times as large in the future. The Powell country is as much adapted to turkey raising as any part of Uncle Sam's domain, and we especially need the birds on the flat to keep the country rid of grasshoppers. This natural food for them reduced much of the cost of their keep. They can well prove to be a net gain of several hundred dollars to the annual income of every farmer on the project. A few farmers on the flat will sell all the way from \$200 to \$300 worth of turkeys this fall. A few farmers received as much for their turkeys as they did from their potato crop.

It all served to bring the business of raising turkeys up to a point where it can be considered as one of the Shoshone project's dependable and intensive industries. It is a crop that seems always sure of finding a market, and the price being offered this year of 20 cents per pound might be considered as the lowest that the Powell flat farmers may expect to

receive in coming years, for this is a season of generally depressed markets.

Second prize at the State potato show at Torrington, Wyo., was won by the exhibit from the Shoshone project arranged and sent by the agricultural department of the school. The prize is worth \$100. It will probably be devoted to defraying the expenses of the winning stock judging team from Powell high school to the Rocky Mountain stock show in Denver, January, 1923.

It was pleasing news to the Huntley and Shoshone farmers to receive notice from the sugar company that, owing to good markets, the company would advance \$1 per ton on the season participating contracts. On December 22 the beet growers on the Shoshone will get \$10,000 additional money as a result.

Thirty-seven farmers on the project consolidated their shipment of sheep under the supervision of the Government agricultural agent. A consignment of three cars was sold to a commission man at Billings. The net proceeds of the sale amounted to \$6,061.

Grinding alfalfa has begun again at the Powell mill. This is pleasing news to the farmers who are now insured a fair market for their hay. The operation of the mill gives employment to a score of men at good wages, and this is gratifying to the merchants of the town.—C. J. B.

HINTS FROM PRACTICAL FARMERS.

Practical Suggestions for Poultry Farmers.

By H. O. Numbers, Loretto, Pa.

THE following New Year's resolution we hope will be adopted by all fanciers and breeders of poultry: "To raise in the esteem of the general public the value and importance of poultry husbandry." Just why this seemingly odd appeal should be accepted, will be shown in the following simple facts:

Too long the industry has been lightly referred to (1) as a hobby or recreative pastime during spare business hours; (2) as a small side line to furnish extra spending money; (3) as a last resort or fund provider for the physical wreck or for the one who thinks easy money can be realized without much labor entailed.

The writer has listened to many lectures by agriculturists, men who were urging the development of farm resources, and in nearly all cases, the poultry end has been referred to in some such manner as "Mrs. So-and-So has a few hens, and realized quite well on their product."

Anyone who takes up poultry as a "hobby" surely has a high degree of selective acumen, or rather demonstrates the hidden desire for that "back to nature" association. Invariably the one with a poultry hobby continually dreams of the time when

he will develop into commercial capacity the line of industry that produces both profit and pleasure.

Quite a number of poultry raisers to-day will tell you "they needed the fresh air, that's why they took up poultry." You seldom hear of anyone leaving the industry, who has been successful, and who was physically incapacitated when he began. No, indeed, after they have recuperated, and learned how to succeed in poultry husbandry, they only began to realize the infinite possibilities to be developed. But the one who takes up the industry merely to have "extra time" on his hands, is usually a failure. The industry requires labor, mental and physical, and above all, attention to details, and constant application.

We recently asked a certain steel king "if he ever made any comparisons of the poultry industry with the steel industry, and if he knew the relative rank, as to annual production, between the two." He said, "No, he always looked on the poultry end as a sort of side line of no consequence." Upon a presentation of figures of annual production, he was amazed. Another business man once asked the writer, "if he ever knew anyone who had made any money in the poultry business." After a long recital of many names, personally known, he admitted his serious intention of "going into the business."

Observe for yourself that any agricultural district of bountiful production is always high in poultry products.

Now to our point: The poultry industry has not been sufficiently advertised. The successful farmers appear to be too busy with their own business to inaugurate a propaganda campaign.

The most successful lady in the turkey business in the United States to-day left a medical profession to engage in raising turkeys. She succeeded, and to-day is an authority on, as well as a propagandist, for poultry husbandry.

There is unlimited room for producers. American poultrymen have accomplished a signal success in having the tariff placed on Chinese eggs. Did you ever know that we had been annually importing more than 70,000,000 dozens of Chinese eggs to the United States? With the tariff protection, we must get busy and produce those 70,000,000 dozens in the United States and keep out inferior quality.

We trust, kind reader, that you will develop those latent desires of "going into the chicken business," and get started. Anyone possessed of the poultry fever has an indomitable character, and will succeed, with proper initiative and "backbone."

"1923" greets us with a tremendous demand. Our country is on its way back to normal. Business is settled. Prices are firm. Now it is up to us to speed up production, and keep out foreign imports of poultry and poultry products. Our great Nation appeals to us to do our part. Winter eggs are demanded—fresh winter eggs. The following suggestions may assist you in winter-egg production: Keep your birds comfortable, well ventilated day and night, plenty of sunshine, a balanced ration; clean and sanitary quarters are essential to egg production. Be sure your ration contains sufficient protein. Watch out for colds and kindred diseases. Heed this warning. A mild winter sometimes leads poultry farmers to become negligent in being constantly on the alert for colds. Remember that one hen with a cold can spread the scourge through a whole flock if not cared for at once. From a mild cold the following may develop: Catarrh, roup, bronchitis, and avian diphtheria. We suggest that twice a week you use potassium permanganate in the water pans; just enough to color the water a wine color. A common trouble this winter appears to be a mild attack of bronchitis. The fowl breathes with difficulty through the mouth, gasping for breath and causing a distressing sound at each inhalation. No other outward signs appear, except to mope around. Remove the afflicted bird at once, use a feather dipped in kerosene, and mop or swab out the throat and mouth. This invariably will relieve the fowl. Remember that just plain kerosene is invaluable around a chicken house. It is a wonderful germicide, and will destroy lice and insects that infest the houses.

Now is the time your male birds should be mated to your best hens for breeding. Don't keep any male birds that are cowards or that are too "gentle-

manly"; the latter variety will neglect feeding their own body, in deference to the hens, and oftentimes they become emaciated and are susceptible to disease.

Above all do not overcrowd your birds; be sure they all have comfortable sleeping quarters and that they all roost on the perch poles. A hen that crowds in the corner to roost, either on the dropping board or on the floor, is sure to catch a cold. A fowl must roost on a pole, to provide proper circulation of pure air and raise it from the foul air from the floor or dropping board.

Don't forget to broadcast the unbounded possibilities of poultry culture and advertise the magnitude of the industry.

Lime and Phosphorus are Vital to Dairy Animal.

Lime and phosphorus, although found in relatively small quantities in feeds, have a great deal to do with milk production and building up the body of the unborn calf. If the cow does not have enough of these elements in her ration she will draw on the supply in her body for a time, and heavy producers commonly do this. Therefore, says the United States Department of Agriculture, it is a good practice to feed cows well when they are running low in milk yield and when they are dry, so that they may store up these elements as well as others in their bodies for use when the large demand is made.

The common view is that dry cows need only enough feed for maintenance, but experiments by the department show that this is not true. The cow is a milk-manufacturing plant, and, like many factories, she must have a reserve supply of materials to draw on when heavy demands are made. A cow that has been well fed when dry and has stored up this reserve is able to produce more on full feed than a cow that was given only a maintenance ration during that resting period. In this way a cow can utilize her capacity the year round although she may not be giving milk all the time.

In keeping up the necessary lime and phosphorus supply it is well to keep in mind the fact that certain feeds are richer than others in these elements. The feeds which contain the most lime are the legume hays, which include cowpea, alfalfa, soy bean, the clovers, and some others. Of those mentioned cowpea hay contains the most lime, and the others are named in the order of their richness in lime. The lime content of hay depends to a great extent on its quality. Leafy alfalfa hay contains more lime than coarse, stemmy hay, and the same is probably true of other hays.

The common dairy feeds that contain the most phosphorus are wheat bran, cottonseed meal, standard wheat middlings, and linseed meal, in the order given. Less common feeds that are high in phosphorus are, in order, sesame-oil cake, rice polish,

buckwheat middlings, rice bran, sunflower-seed cake, rapeseed cake, buckwheat bran, and malt sprouts.

No grain or other concentrate contains anywhere near so much lime as the legume hays; and no kind of roughage contains phosphorus in quantities comparable to those found in the concentrates mentioned above. Grass hays, corn silage, and corn products, with the possible exception of those made from the germs, are low in both lime and phosphorus.

Profits of Dairy Industry Revealed Through Herd Testing.

By L. E. Cline, Agriculturist, Newlands Project.

A careful analysis of the dairy industry of the Newlands project serves to show that it is one of the surest industries that this valley can engage in. With our present dairy development we are sure of a steady and daily income regardless of inclement weather or financial depression.

Fifty-four dairy herds on test by the Newlands Project Herd Testing Association during the month of October showed an average production per cow of 734.9 pounds of milk and 28.69 pounds of butter fat. When it is considered that all the producing cows of 54 herds were tested regardless of period of lactation, these figures show a very good rate of production and may also be taken as a fair indication of what is possible with better care of animals and with better selection of individual cows.

The average price of butter fat for October as based on San Francisco quotations for extras was 54 cents per pound. This was approximately the price received by local dairymen. With this price of butter fat the average gross return per cow for October was \$15.49 for butter fat. In addition to this there was an average of 706 pounds of skim milk per cow, which, at 25 cents per hundred, has a value of \$1.76, making a gross return per cow of \$17.25. If we charge the average cow in the association with 1,100 pounds of hay for the month at \$10 per ton, then we have these producing cows that were on test making a gross return of \$31.36 for each ton of hay consumed. This gross return minus the value of the hay on the farm leaves \$21.36 as a net return above feed cost. Since all dairy herds must carry a certain per cent of dry cows, estimated as 16 per cent of the herd, which continue to eat hay while they are not producing, this feed cost must be charged to the producing cows of the herd. If we reduce our figure of \$21.36 by charging each cow with 16 per cent more hay valued at 88 cents to make up for hay eaten by dry cows, we still have a net return of \$20.48 per ton of hay consumed after the hay has been sold to the cattle for \$10 per ton. This should be a good return for labor expended and interest on dairy herd and dairy equipment.

It is very doubtful whether any other agricultural industry in our valley upon similar analysis and cover-

ing as many farms could show anything like as satisfactory returns.

Success-Controlling Factors in Cooperation Outlined.

Seven relatively important factors have been found to control the success of farmer cooperative organizations, according to Lloyd S. Tenny, assistant chief of the Bureau of Agricultural Economics, United States Department of Agriculture. The seven factors enunciated are the result of a careful study of both successful and unsuccessful farmer cooperation both here and abroad.

1. The association must have a definite object in view. Interviews with farmers disclose that farmers frequently do not know the purpose for which the organization is being formed.

2. The organization must be formed on a commodity basis. Both at home and abroad the outstanding successes in cooperative marketing have almost invariably confined their operation to a single agricultural product or to a group of products very closely allied.

3. There must be a sufficient volume of business to cover operating costs, and the business should be controlled or under contract by the association. Many efforts in cooperation have failed because the farmers were willing enough to promise to sell their products through the association, but when the time to deliver these products came there appeared to be equally good reasons why the promises should not be fulfilled. It is not good business for a commercial organization to attempt to proceed without contracts.

4. Good management. No business can succeed without good management. The management is not only concerned with selling the products profitably, but must also recognize the individual member in the association and must function in such a manner as to satisfy this human element.

5. Proper accounting.

6. Educated membership. The members must have complete knowledge of the aims and conduct of the organization.

7. Self-perpetuating. The organization must be established and operated on lines that include and make use of the best thought and experience available; once organized it should be unnecessary to call on outside aid to reestablish policies, to provide a board of directors or management to conduct affairs.

"Practically all, if not all, of the failures in cooperative marketing violate one or more of these factors," Mr. Tenny says. He also calls attention to the emphasis that is now being given the form of cooperation. "The form of organization may be immaterial and should be subordinate to the basic factors that have been found to make for success. No organization, either local or national, that is imperialistic in that it does not develop an educated membership can achieve success."

The production and sale of cotton from a limited acreage on the Rio Grande project had produced to the end of November, 1922, approximately \$1,000,000.

PROJECT WOMEN AND THEIR INTERESTS.

By Mrs. Louella Littlepage.

IN one of Washington's art shops there hangs a picture of Joan of Arc. Irresistably one is drawn to it again and again, and the wonder grows as to what it is in this humble peasant girl of Brittany which so fascinates one. It is not that she helped to free her unfortunate countrymen from a foreign foe; there have been brave women since time began. She represents far more than this. She has come to stand for the woman with a vision, the woman who is seeking to do her part in the betterment of the world. Wherever her figure appears it is always looking forward, the light of a great purpose in her eyes, the will for achievement in every line of her face. As she raises her standard aloft in this simple picture one seems to see gathering behind it innumerable hosts of those who would follow her lead. A daughter of war-ridden fifteenth-century France, she nevertheless symbolizes the woman of the twentieth century, eager to take a part in the work of the world and in the great life-giving enterprises of peace.

'Tis a far cry from a fifteenth-century battlefield of the Old World to a humble ranch home in the desert, yet here great battles are being fought, great victories won, every woman standing gamely by her guns, if one can believe our great criterion, the American press.

"Happy New Year," we hail one another in passing; prosperous too, we hope the year will be; but whether entirely happy or prosperous it is quite certain that the project women will still advance, moving to a new position in the young year as they would move to a new house, leaving the rubbish behind.

A Picturesque Custom.

Portland has its rose carnival, Seattle its potlatch day, Pasadena and other California towns their flower festivals, but El Paso has instituted an annual custom which holds possibilities of outranking them all, at least in the unique character and variety of its features.

On November 10 the population flocked to the Mesa, where for three hours a thousand kites soared high above the city in a keen contest which was eagerly watched by the friends and families of El Paso's school children. There were kites of almost every shape and size known to Americans, the brilliant coloring producing a pleasing effect.

All of the kites were made outside of school, with the exception of some help the children received from

the manual training and playground teachers. Girls as well as boys were instructed how to make frames which would fly high and also in a way to insure speed. The contest was divided in two sections, one set of rules applying to children from the fourth to sixth grades, and another set for boys and girls in the seventh grade and junior high school.

Children in the grammar schools competed for a large silver loving cup which went to the school getting the most individual ribbons. The school winning the cup for three successive years gets it to keep. Ribbons were given for the most artistic kites, for the highest flier, smallest plain kite, largest box kite, strongest puller under 3½ feet, suspended banner and star kite, most original reel, quarter-mile dash, figure kite, airplane construction, and tailless kite.

This contest holds unlimited possibilities, and El Paso can be trusted to develop them.

It must be a real privilege for a child to live in El Paso, if one can judge by their recent activities. Almost everywhere during December children are being importuned to express their wishes for Christmas presents, and the days are given over to making them happy, while they are denied the joy the real spirit of Christmas should bring—the joy of giving, not getting.

Down in El Paso the children have been busy as bees preparing for a big sale of dolls for the benefit of the Associated Charities Day Nursery, and 400 dolls, each bearing the name of its donor, were at last placed on sale, a few of them being put aside to make a happier Christmas for the little girls who are kept at the nursery while their mothers are at work.

There were rag dolls, dolls of bisque, and celluloid and china. There were brides and babies and flappers, gipsies and sports, dolls in evening gowns and dolls in rompers. Even the very little girls were urged to lend a hand. Clothes pins and lollypops and other articles were painted and dressed. The girls in the domestic classes in school had doll dressing as the subject of some of their lessons and made model outfits such as the proper attire for sport wear, the correct school and party frocks, etc.

The money will be used to provide hot, nourishing meals, clean aprons, a warm sunny place to play, and proper supervision for the little children who are left every day at the nursery. There will also be furnished some toys for their amusement, and it takes a good many balls and dolls and games to go around.

A recent issue of an El Paso paper carried an interesting group picture showing the "mayor," "city clerk," "sanitary officer," and "city treasurer." These are the members who make up the "city council" of the Lamar School, which is the first of the city schools to adopt the system of "local government." The occasion when these officers were elected had all the thrills of a regular political campaign.

Under the plan each schoolroom is entitled to a councilman and health officer. These, with the city council proper, hold regular weekly meetings. When the "mayor" raps the sessions to order with his gavel, it means nothing but business from that time until adjournment. The "city clerk" keeps regular minutes of all the proceedings.

The "council" takes up all matters pertaining to the good of the school. Swearing, playing marbles for keeps, and other bad habits are severely frowned upon by the "city fathers."

An Ice-bound Club.

One of the best things about a real club woman is that she never gets over it. She is always a "builder." A case in point is the Rimrock Woman's Club, Washington. To begin at the beginning: About 11 or 12 years ago there sprang up in the sage-covered hills of the Tieton project an organization known as "the mothers' club." A few years ago one of these progressive women, Mrs. H. G. Cowling, took up her residence at Rimrock, where through summer suns and winter snows a thousand men are building a great storage dam.

Located high up in the mountains of the extreme Northwest, the camp is literally cut off from the world by snow and ice for weeks at a time during the winter months. Came the first moment of isolation, and all her club training urged Mrs. Cowling to organize the women for study and entertainment. Thus the Rimrock club was born.

At a recent meeting plans for the winter were formulated; then a visitor from Yakima gave a talk on mountain birds. The informal discussion which followed disclosed the fact that a water ousel, one of the most delightful of forest birds, had made its home the past summer on Wildcat Mountain, not far from the camp; that a family of woodpeckers had been raised near the home of one of the club members, and that the family of the construction engineer had the pleasure of entertaining three humming birds in their yard during the past summer. Crows and juncos and bluejays and chickadees were in the hills to a late date and a pleasant and profitable discussion of their habits was enjoyed.

In its short existence the club has accomplished a number of worthwhile things for the camp, one of the most noteworthy being the social spirit which it has

fostered. It has been responsible for having the school remodeled, so that it can be used for dancing and theater and various entertainments. Water and a kitchen have been put in, stage lights, etc. There is also a rest room, with a cot and easy chairs, where mothers attending the club or school or entertainments may leave their babies. They have installed a piano, which is a delight for the music lovers. A story-telling hour proved a pleasant innovation, and sewing class for the younger girls was one of the summer activities. The girls enjoyed the work and did highly commendable work. Classes for making dress forms proved popular, and many of the Rimrock homes possess lay figures which make the women quite independent of dressmakers. The club is sponsoring a millinery class.

A program on child management and a child clinic, in which camp babies and school children were measured and weighed for nutrition tests, are among other features of this ice-bound club. More power to them.

Mother Goose Fantasy.

"The most successful musical treat of years," was the comment of local papers on the operetta presented by the music department of the Carlsbad Women's Club December 6.

The women's organizations on the Carlsbad project, New Mexico, always active in advancing the interests of the community, scored a double success in this presentation. The "fantasy" was not intended to be a fund-raising performance, but merely given with the idea of creating greater musical interest. Their presentation of the charming operetta was so well received, however, that another entertainment is already planned. The house was packed to the doors, many people standing through the entire evening, and there is a tidy little sum in the treasury of the club, which is most gratifying.

The women of one of the local churches in Carlsbad gave a bazaar and dinner recently which not only netted them \$250, but which was so charmingly unique that other organizations may find worth-while suggestions in the plan.

The tables were handsomely decorated, each one representing one of the months of the year, with centerpieces depicting some typical scenes, and each table attended by two girls appropriately garbed. January had for its centerpiece a winter scene; February, a valentine table; March, St. Patrick day; April, Easter; May, a miniature May pole and dance; June, a bridal scene; July, Columbia and Uncle Sam; August, a vacation scene on the water; September, a butterfly scene; October, autumn; November, lavender and white chrysanthemums; December, a Christmas tree.

For a smaller affair the four seasons might be represented.

The bazaar booths, against the walls, were also appropriately decorated.

Through the generosity of students in the sewing classes of the Caldwell High School, Boise project, Idaho, 80 garments were presented to the children's home for the children who are cared for by the institution. The class furnished the material and constructed the dresses and other garments. They have been working for a month on the clothes and have not only learned much about fashioning clothing, but have the added satisfaction of knowing that their own efforts have helped make comfortable many children less fortunate than themselves.

Winter Picnics.

The people of Grandview, on the Sunnyside Division of the Yakima project, Washington, don't propose to let old Winter put an end to their delightful community meetings, so they have started a series of indoor picnics.

If you live in the Grandview district you are invited. All you have to do is to pack up your lunch just as you would for an outdoor picnic, bundle up the children, and be at the hall at 6.30. Coffee will be provided but you must have your own dishes.

There are funny stunts, community singing, a short talk on some subject of interest to all, and a general good time.

Grandview is to be congratulated on having so many public-spirited people. Nine people out of every ten will say promptly that such a meeting would be a great thing for their community, and then about seven out of that nine as a rule will find themselves a little tired, or think of something they should attend to, and anyway it is much easier to stay at home. It takes a live community to get out and make such meetings pleasant and profitable.

Rest Room Adds New Feature.

A new feature of the free rest room in Grand Junction, Grand Valley project, Colorado, is the women's exchange counter, which has met with surprising success. The counter and shelves display a wonderful variety of the handiwork of women, including almost every article known in that line. There has been a brisk sale of these articles so far, partly due no doubt to the holiday season, but also on account of the fact that these articles have not before been available to the women of the section. A small percentage is deducted for handling the wares, and this sum will be available for running the rest room.

The Parent-Teachers' Association of Phoenix, Salt River project, Arizona, is installing two beds in the Deaconess Hospital for the use of sick and crippled children of parents unable to pay their expenses in

the institution. This room will be set apart for this purpose and supported by the association.

Women's Civic Club Organizes.

The organization of a woman's civic club in Fallon, Newlands project, Nevada, has been effected with 26 charter members. "To make Fallon one of the best towns in the State through beautifying the city and improving its morals" is one of the aims of the club.

In order to acquaint themselves with the processes of municipal government a committee will visit the city council at its meetings the first Monday of each month. Meetings will be held every Saturday afternoon.

A Citizens Training Camp.

The city of Orland, Orland project, California, recently organized a junior chamber of commerce at the high school, under the most favorable auspices. Evidently the special God who watches over community effort was in accord with the new project, for they were treated to an address which would inspire the most unenthusiastic into a realization of his duty of service to the community in which he lives. It was pointed out that each and every person owes a duty to the community and they were given a vision of the responsibilities that rest upon them in doing their share in making their town a better, more wholesome and pleasant place in which to live.

The junior chamber of commerce might well be called a citizens training camp, an organization of responsible young men and women in which community ideals and cooperative effort are the aims. The new organization will bring the young men and women of Orland together on a common footing, train them in working together, and keep them in touch with the efforts of the larger organization in which they will soon be expected to take a responsible part. They will also enjoy a certain amount of good times, all tending toward the ideals of citizen training.

This is the first organization of its kind in the valley and one of the first in the State. It starts out with every augury for success, with an initial membership composed of bright and ambitious young men and women, at a time when there is opportunity for constructive work in abundance for them to do.

A Montrose, Colo., paper announces that some of the farm women are getting more for their turkeys than their husbands make from 40 acres of potatoes. One specific instance is the flock of turkeys raised by Mrs. J. G. Brown, who last spring set turkey eggs under her hens in town. When school was over early in June, she moved out to her ranch. She

raised 125 turkeys at a cost of not more than \$50. At the lowest price offered her she could sell the flock for \$550. They are beautiful bronze birds, averaging 18 pounds straight through. She fed them when young on cottage cheese, and later on sour milk, ground oats, and wheat, and they ran at large eating grasshoppers and bugs. She lost only one bird, and that was eaten by coyotes.

Bulletin Boards.

A certain woman who spent a number of years in a commercial house before taking up housekeeping, carried several business ideas into her home, one of the striking ones being a bulletin board which hung in the sunny kitchen where the family liked to linger because of its homey arrangement.

This board not only served for reminders like club and church notices, dates of entertainment or meetings, etc., but timely articles cut from papers, pictures and art prints from the Sunday papers for the entertainment of the children, or an occasional poem. Anything good to look at, or that would serve as a means of interesting any member of the family, was put on the board. It is an idea with possibilities.

Washing Woolens.

Woolen dresses may be washed successfully if proper care is taken. First, brush the garment well, especially inside the seams where dust is likely to accumulate. Mark soiled spots by basting around them in white thread. Also baste down the folded edges of plaits. Avoid change of temperature in water to keep from shrinking the goods. Wash and rinse in warm water and dry also in a warm place. Make a soap solution by dissolving the soap in the water; do not rub soap on the goods as it mats the fibers, and squeeze the goods instead of rubbing on a board for the same reason. Squeeze the water out instead of twisting the goods. If the garment is much soiled put it through two soapy waters and run it through two rinse waters. Hang skirts on hangers by the waist bands, and dresses and waists on hangers. Press the garment on the wrong side while still damp, using a heavy pressing cloth over the wool. Do not use too hot an iron as it stiffens the goods. The process is a little tedious, but if followed carefully will save a stiff bill at the cleaners.

What's Your System?

In this day of labor savers do women still find it profitable to follow grandmother's rule of "Monday to wash, Tuesday to iron, Wednesday to mend, Thursday to clean, Friday to call, and Saturday to bake," or have they found some more elastic manner of attacking these problems of housekeeping which must always be solved before a woman is free to

think of the finer details of home making? The question was recently placed before a dozen expert home makers on the Yakima project, Washington, and the replies were most interesting. It would be enlightening to hear from women on the various projects on this same question.

Practically all of these experts do follow a system, though they vary to suit individual cases, but the net result seems to be that the women who are still doing their own work are not doing it all the time as they once were. There are two reasons for this; an improvement in the system, and the many labor-saving devices. These devices only make the work less strenuous, it is still there to do, but they do save time and strength, the two most important items housekeepers have to plan to conserve.—L. L.

HONOR ROLL.

The prompt repayment of the charges due the Government for the construction of irrigation works is one of the most helpful means of continuing the work of the service through the expenditure again and again of this trust fund, which has been dedicated to home making. This honor roll, which we are printing from time to time, will carry the names of those water users who, in our judgment, stand out most conspicuously as leaders in the movement to repay these costs in full and in advance if possible.

The project manager of the Newlands project, Nevada, sends us the following list of water users holding contracts under the extension act who have made payment in full of construction charges: James F. Mayfield, Katharine V. Aikens, L. L. Hudson, John G. Hassard, F. E. Gibbs, John B. Machin, W. P. Clark, J. W. Danielson, Edna E. Anderson, and Churchill Creamery (Inc.).

The Klamath irrigation district has paid in full all charges due.

On December 1, the due date, the Orland Unit Water Users' Association, covering the Orland project, California, remitted to the local fiscal agent the sum of \$66,574.36, discharging in full the seventh installment of the construction charge on the Orland project. Thus that project continues its splendid record of full payment always on time. On the Orland project the original conception of the framers of the national reclamation law has been realized more exactly than on any other project.

The first list of names was published in the November issue of the RECORD.

Water-right repayments on the Carlsbad project for the month of November, 1922, amounted to \$4,181.52, of which \$2,832.29 covered bills for construction charges not due until December 1.

NOTES FROM THE NORTH PLATTE (INTERSTATE) PROJECT.**B. J. Seger, Secretary-Treasurer, Scottsbluff, Nebr.**

WATER users under the North Platte project are gratified to know that the columns of the RECLAMATION RECORD are again open for the discussion of the many problems that must be met by irrigation farmers under our reclamation projects. We therefore welcome the opportunity to make use of the columns of the RECORD from time to time. [We are particularly glad to have Mr. Seger with us again.—*Editor.*]

Farmers under the North Platte project have never put so much thought, earnest effort, and hard work into the growing of crops as during the season just past. The results where such an effort has been put forth have been most gratifying, except where crops were damaged by grasshoppers. On account of the extremely dry season a higher average number of acre-feet of water was used than for any previous season and at the same time a larger percentage of water users used the water economically, exercising greater care than ever before to keep from wasting water. Many farmers who have heretofore hired considerable help during the irrigation season dispensed with hired help this year in an effort to economize, working longer days and calling on members of the family from time to time for help when occasion demanded. Those having beets or potatoes were compelled to hire some help at harvest time.

Many of our water users went into the 1922 irrigation season with a handicap of debt due in some instances to losses in feeding the past two years, but mostly due to the low price received for grain and hay last year and lower prices for other crops than had prevailed the year before, with the result that a good many were not able to pay their water-right charges.

Those who had borrowed money at the banks to finance them in feeding stock or in their farming operations, were not able to pay all of their indebtedness at the banks, interest on farm mortgages, and taxes. But in spite of this handicap practically every water user put forth his best effort to raise a good crop. Those who raised the best crop of potatoes this year are really in the worst condition, for it in an expensive crop to harvest and there has been practically no market. Thousands of bushels are now stored in large potato cellars or are siloed in large piles in the field.

Those who had a large acreage of grain failed to make any money on that crop owing to the low price of grain and a small average yield per acre on account of damage by grasshoppers. So that the

farmer who depended on grain and potatoes for his main crop is disappointed at the close of the irrigation season and will have difficulty in meeting even his most pressing obligations.

Beets are making a better yield than last year, averaging almost 14 tons per acre from the entire 50,000 acres grown in the North Platte Valley. But as only about 10 per cent of our project lands is planted to beets that crop will not help very many of our project farmers this year. The alfalfa crop is fairly good and prices are better than last year, but the acreage is not so large on account of a considerable acreage being ploughed up for beets and potatoes and failure to get a stand of new alfalfa. Many farmers have seeded alfalfa the second and third time, getting a good stand each time only to lose it on account of the grasshoppers. Through the efforts of the Farm Bureau there was a more concerted effort on the part of the project farmers to spread grasshopper poison this year than ever before in an effort to combat the pest, and good work has been done. This work was done at considerable expense to the individual farmer.

There is more stock being fed this year than last. Approximately 125,000 sheep and 5,000 head of cattle are being fed in the North Platte Valley. This is about twice the number that were fed last year. It will mean that practically all the roughage, beet tops, and hay will be fed on the land, making ready sale for hay and other feed and will add much to the fertility of the farms where feeding is done.

Farming under irrigation is more expensive than farming in the rain belt, and unless each acre is made to bring adequate returns the profit will be small. So most of our farmers have come to realize that it is more important to practice intensive farming under irrigation than on lands not irrigated.

Good marketing facilities must go hand in hand with intensive farming on our irrigation projects. We have found on this project that the lack of marketing facilities has been a serious handicap. Our farmers realize that the bulk of the crops grown on an irrigated farm should be fed to live stock and marketed in that way; and that each farmer should have at least a half dozen good grade milch cows and some thoroughbred hogs.

It has cost so much to level the land, build field laterals and structures, buy expensive farming equipment, and make necessary improvements that the average farmer has used all of his credit with the bank and store and is not in a position to give addi-

tional security with which to buy dairy cows and hogs or other stock which he realizes he should have on the farm if it is to be maintained in its highest state of fertility.

There are several definite and important things that should be brought about at the earliest possible date if our project farmers are to succeed ultimately.

Provide for securing money at a low rate of interest in adequate amounts for the purchase of stock, dairy cows, hogs, and necessary farm improvements for landowners under the project, and to take up existing high interest-bearing mortgages.

Within the past year the Federal land bank has disregarded the Government's lien for water-right payments and is now loaning money on lands under reclamation projects. This has been of material help in this valley and a good many farmers have taken advantage of this aid; however, the provisions governing such loans are not broad enough. At present the requirements are that a borrower of Federal land bank money shall live on the farm on which he is securing the loan, or shall own the equipment and hire the work done. Under the North Platte project 60 per cent of our farms are being farmed by tenants, leaving but 40 per cent who would be entitled to make application for Federal farm loan money. Out of this 60 per cent, however, 52 per cent live in the 10 towns adjoining or near by the lands under the project and are in position to give their farms reasonably close personal supervision. Only 8 per cent may be termed nonresidents. The majority of the 60 per cent landowners who do not live on their farms need the advantages of the Federal farm loans as much as those who live on the lands to build up and improve their farms. The Federal land bank law should then be amended so that loans could be made to those landowners under the project who live near enough to the land to give it personal supervision, with the provision that all of the loan secured be used for the purposes enumerated on that particular farm. Further, the amount which the Federal land bank is allowed to loan is inadequate to be of material help to farmers under irrigation projects.

Cooperative marketing and the establishment of sufficient cold-storage plants for the needs of the project are essential.

One of the main uses for cold-storage plants or warehouses in this valley would be to take care of the immense potato crops raised each year. Thousands of dollars would have been saved our project farmers this year had adequate storage facilities been established in connection with a well organized selling association.

Such storage plants could be equipped to handle poultry and eggs in addition on a large scale. The Federal Farm Bureau is now working on a cooperative marketing plan that is far reaching and should be very effective.

Our project people feel that there is a disposition on the part of the officials of the Reclamation Service to help work out some plan which will enable project farmers to make a success of their farming operations and to make it possible for them to build for themselves real homes where they can rear their families in comfort and happiness. It is evident that successful farmers will make a successful reclamation project, and no one wishes to see any but happy and contented people living on our projects.

Appropriations, Fiscal Year 1924.

THE Budget for the next fiscal year, having been transmitted to Congress by the President, has become public. This proposes an appropriation of \$12,250,000 from the reclamation fund for the following projects:

Salt River project, Arizona-----	\$5,000
Yuma project, Arizona-California-----	430,000
Orland project, California-----	50,000
Grand Valley project, Colorado-----	395,000
Uncompahgre project, Colorado-----	185,000
Boise project, Idaho-----	1,390,000
King Hill project, Idaho-----	35,000
Minidoka project, Idaho-----	665,000
Huntley project, Montana-----	115,000
Milk River project, Montana-----	140,000
Sun River project, Montana-----	145,000
Lower Yellowstone project, Montana-North Dakota-----	120,000
North Platte project, Nebraska-Wyoming--	1,420,000
Newlands project, Nevada-----	735,000
Carlsbad project, New Mexico-----	80,000
Rio Grande project, New Mexico-Texas---	900,000
North Dakota pumping project, North Da- kota-----	100,000
Baker project, Oregon-----	500,000
Umatilla project, Oregon-----	900,000
Klamath project, Oregon-California-----	700,000
Belle Fourche project, South Dakota-----	95,000
Strawberry Valley project, Utah-----	45,000
Okanogan project, Washington-----	65,000
Yakima project, Washington-----	1,310,000
Riverton project, Wyoming-----	600,000
Shoshone project, Wyoming-----	925,000
Secondary projects-----	100,000
Colorado River investigations-----	100,000
Total-----	12,250,000

In addition there is proposed an appropriation of \$11,000 from the general fund of the Treasury to reimburse the reclamation fund on account of operation and maintenance expense represented by stored water supplied from the Yakima project, Washington, to the Yakima Indian Reservation.

There are also proposed appropriations for the Montana Indian projects under construction by the Reclamation Service for the Indian Service, as follows:

Blackfeet project, Montana-----	\$60,000
Flathead project, Montana-----	555,000
Fort Peck project, Montana-----	30,000
Total-----	645,000

WATER MEASUREMENTS ON THE SALT RIVER PROJECT.

By C. C. Cragin, General Superintendent and Chief Engineer.

THE Salt River Valley Water Users' Association delivers water to approximately 240,000 acres in the Salt River Valley, Ariz.; 203,000 acres are included within the Reclamation Service project under the Roosevelt Dam, and the balance receives water through the main canals and laterals of that system constructed or reconstructed under the reclamation law.



SKETCH MAP OF THE SALT RIVER PROJECT, ARIZONA

The average amount of water required annually is 1,100,000 acre-feet. This demand varies from an average of approximately 3 per cent in December to over 13 per cent in June, but has exceeded 160,000 acre-feet in a single month, depending on weather and crop conditions.

With the advent of large areas in cotton and greatly increased areas of truck farms, the demand became imperative for the accurate timing of water over this large area, as prompt service and the conservation of water could not be fostered without it. The timing of water on this project is somewhat complicated by the fact that the water supply of this valley comes from four sources:

1. The flow of the Salt River regulated by the Roosevelt Reservoir (6,110 square miles drainage area).
2. The unregulated flow of the Verde River (6,260 square miles drainage area).

3. The normal flow of return water at Joint Head Dam.
4. Pumped water.

The probability of extended periods of drought and need for drainage requires, as near as is practicable, the constant operation of approximately 100 pumps. However, owing to the quality of some of this pumped water, quantities of it can be used only when the demand in certain areas is large enough to make its mixture with river water permissible. The normal flow at Joint Head Dam varies from approximately 60,000 to 90,000 acre-feet per year. The normal flow of the Verde River varies daily from 50 second-feet in dry periods to floods exceeding 150,000 second-feet. The variations of these three sources are controlled by the draft on Roosevelt Reservoir, 49 miles from the point of diversion.

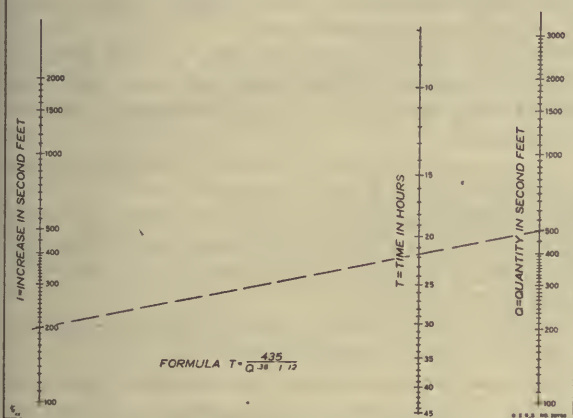
Another element affecting water regulation at Granite Reef is the varying power load, which results in a constantly fluctuating flow through the Roosevelt power house. This and the varying water draft on Roosevelt Reservoir is controlled by a gauging station below Roosevelt Dam, electrically operated. The marker of this gauge is placed on the switchboard of the power house and is held steady or varied according to the water order by three electrically-operated 54-inch needle valves. Careless operation can, of course, be traced direct to the operator responsible, as the gauge is also recording and inaccurate attention is shown at the hour that it occurred.

The need for accurate timing and dispatching of water under such conditions is apparent. Good service, which means increased crop production, and the conservation of water make it imperative where the water supply is limited. Aside from the standpoint of prompt service, additional water in the canal system above actual crop requirements would make unnecessary great accuracy in dispatch, but the water requirements and available supply of this valley demand the lowest limit of operating waste.

Several months' preliminary study was made of the elapsed time necessary for the appearance at Granite Reef diversion of upstream changes. This study showed that the time required for a given change in discharge at Roosevelt Dam to reach Granite Reef varied from eight hours with 3,000 second-feet flow to nearly two days for a low flow of 100 second-feet. Similarly, on the Verde River for the 70-mile distance from Childs to Granite Reef, 12 hours to nearly 3 days elapsed for like quantities.

Nomographs were prepared in which a line drawn from the quantity column at the right to the change in flow at Childs, at the left, intersects the time column in the center, showing the number of hours required for such change to reach Granite Reef. In conjunction with this variation and the variation of pumped water and return flow at Joint Head, the variation of the water order is made at Roosevelt by use of a similar Salt River nomograph shown below. During the past 12 months, after less than one year's previous operation, the water at Granite Reef has been held within less than 2 per cent of the required water.

NOMOGRAPH OF WATER TIME FROM ROOSEVELT
TO HEAD OF CANALS AT GRANITE REEF



Example: With 500 second-feet flowing, 21½ hours are required for an addition of 200 second-feet at Roosevelt to reach Granite Reef Dam.

The irrigated area extends over 34 miles in an east and west and 30 miles in a north and south direction. With the water at the head correctly regulated, the problem of dispatching water through this widely extended system is met in a similar manner. Additional main canal recording gauge stations have been installed and approximately 150 lateral head gates rated for varying gate openings under varying differences in head above and below the gate.

During the first year's operation, under conditions of accurate timing of water, approximately 90,000 separate runs of water were delivered to the farmers, as follows: 85 per cent within 24 hours of time for which water was ordered, 13 per cent within 48 hours of time for which water was ordered, 2 per cent (one head ditch) within 96 hours of time for which water was ordered.

A better feeling among the farmers as to service is apparent and is largely attributed to this improvement.

The entire operation waste for sluicing and unavoidable tail-ditch waste has been reduced to less than 10,000 acre-feet for the whole 12 months, or less than

one-tenth of 1 per cent of the water diverted and developed. It is conservatively estimated that an annual saving of over 30,000 acre-feet can be effected.

The permanent rating of lateral gates, as recently accomplished on this project, has resulted in a large saving in the annual cost of hydrographic measurements, to the extent that the entire cost of the above-described work, together with the annual operating expenses of all other work of the hydrographic department, was several hundred dollars less than the previous cost for ordinary operation of this department. A more detailed description of the above and of the other work performed by the hydrographic department is contained in the following excerpt from a chapter on Hydrography, by J. G. Bailhache, Salt River Project History for 1920-21.

Hydraulic records.—These are kept of (1) watershed conditions; (2) rainfall; (3) run-off; (4) river discharge, including floods; (5) evaporation; (6) seepage; (7) water pumped; (8) water diverted; (9) water wasted; (10) water used for irrigation.

Hydraulic factors.—In order to control accurately the water supply the following five factors are requisite:

- (1) Quantity of water being drawn at any time from Roosevelt.
- (2) The hour at which a corresponding change in flow will be apparent at Granite Reef after traversing the 49 miles of river from reservoir to diversion Dam.
- (3) Quantity of water available at all times in the Verde River at the rating station (located at Childs, 70 miles above Granite Reef).
- (4) Time required for a change in flow at Childs to produce a corresponding change at Granite Reef.
- (5) Quantity of water in Salt River at Granite Reef.

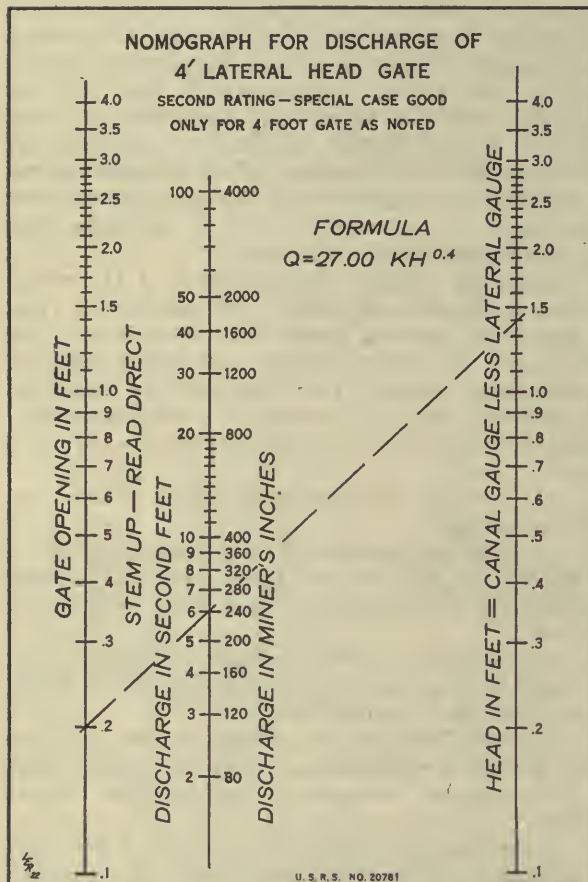
These facts are obtained from records at five river stations, as follows: (1) Tonto Creek, (2) Roosevelt Dam, Salt River, (3) power canal dam, Salt River, (4) Childs Station on Verde, and (5) Granite Reef Dam, Salt River.

Distribution factors.—In connection with this work 40 main canal stations are maintained and numerous lateral stations, the latter being especially troublesome to maintain. Stick-gate ratings are objected to on account of liability of error for any of the following reasons:

1. When moss or weeds grow in the ditch.
2. When ditch gets sand in it or partially fills with silt.
3. When ditch becomes dirty or trash gets in it.
4. When ditch is cleaned.
5. When water is checked for any reason.

Wherever feasible the stick ratings have been changed to gate ratings (6 main canal and 125 lateral gates having been rated to date), and the advantages are as follows:

1. The rating will hold good and not change with the condition of the canal and lateral.
2. After the rating is once made for all conditions with trash kept out of gate, no operating conditions can make the rating incorrect.



Example: Gate opening, 0.2 foot; head, 1.4 feet; discharge equals 6 second-feet.

3. It operates correctly with checked delivery or without.
4. It eliminates expense of reratings after they are correctly established.

Field operations.—In order to utilize this system of gate ratings, nomographs have been prepared (see illustration) which are furnished to the ditch riders or zanjeros, as they are called, on the Salt River project.

For measuring the water through the gate—

First, read canal gauge.

Second, read lateral gauge.

Third, subtract lateral-gauge reading from canal-gauge reading, giving the head or right-hand column of nomograph.

Fourth, read gate opening on gate stem, giving the left-hand column of nomograph.

Fifth, lay rule or straight edge on the two points of right and left hand columns, respectively, of nomograph and the discharge in second-feet at gate, regardless of the condition of the lateral, is given in center column.

By this system a change in the flow of water can be made in a short time without leaving the head gate.

Variety and character of work and records.—1. A water-check system has been inaugurated in which the water in lower canals is figured back to upper canals with proper allowance for losses, and this computation is extended back through upper canals to the Granite Reef diversion dam and thence to the Verde River and the Roosevelt Reservoir with all factors considered, including inflow, rainfall, and evaporation.

2. Pump discharges are rated and measured at intervals to insure correct data.

3. Daily water report includes records of conditions at Roosevelt, on the Verde, and on the North and South Side Canals, and weather conditions affecting evaporation.

4. Automatic regulating devices have been installed, and also several Venturi meters.

5. Hydrograph of daily flow of Salt and Verde Rivers for past 21 years have been made, and numerous reports for other departments of the association and the Government.

6. Over 2,500 current meter water measurements have been made during the year.

7. Preparation of water time schedules, which includes utilizing recording gauges on rivers and canals and plotting results.

8. Preparation of rating charts or nomographs for each gate, prints being furnished to ditch riders and superintendents.

Results.—As a result of this work, it is now possible to send any desired quantity of water from Roosevelt Reservoir to Granite Reef Dam, time its arrival, and maintain the required flow at the diversion points with practically the regularity of a railroad schedule, and by the aid of the nomographs the quantity of water can be readily and accurately ascertained.

Economy of the system.—1. Now, except for flashy floods, there is practically no waste of water at Granite Reef Dam diversion, as time schedule makes it possible to maintain a flow equal to orders for water.

2. In one case the rating of headgates has saved an hour of a pump operator's time and 12 miles of transportation.

3. Installation of an electric long-distance indicating gauge at Roosevelt has effected a saving of about \$1,200 per year.

4. In a seven months' period it is estimated that there has been a saving of at least 30,000 acre-feet of water.

A UMATILLA FARMER WHOSE WORK IS SWEET TO HIM.

By Charles Taylor, Hydrographer, Umatilla Project.

JENS SKOVBO, one of the most successful beekeepers in the State of Oregon, is a native of Denmark, and came to America when a young man in 1906. During the first two years he traveled around considerably, looking for something suitable to tie to. Eventually, in 1908, he came to the Umatilla project, and with native acumen, decided that it was a district with a future and a good place in which to live.

The project was young and considerable construction was being done. Mr. Skovbo, with team and Fresno, worked for the Government, and also at leveling land for new settlers. At the same time he took out his first naturalization papers, and secured a desert-land assignment of 25 acres. Continuing to work for others, he used the money earned and part of his time improving his land.

In 1916, receiving a good offer for his farm, which was then well improved, he promptly accepted and immediately bought 120 acres of which 53 acres were irrigable. To-day this is a well improved farm and worth several thousand dollars. One of the principal sources of income that has placed him on "Easy Street," Mr. Skovbo ascribes to his bees. He has

600 hives, which yielded 58,000 pounds of honey this year. That the honey is of fine quality is proven by the demand for it. This year Mr. Skovbo has shipped to California, British Columbia, Alberta, and one shipment of 12,000 pounds to Copenhagen, Denmark.

Naturally enough, Mr. Skovbo takes an active interest in State and county affairs, especially bee associations. He is vice president of the Oregon State Beekeepers Association, and secretary of the Umatilla County Beekeepers Association. In addition, he was chosen to represent Oregon at the American Honey Producers' League convention held at Salt Lake City last year; and will again represent Oregon at the convention to be held at St. Louis in February, 1923.

Besides selling in bulk, Mr. Skovbo puts up honey in packages for parcel-post shipments, which, because of their utility and attractive appearance, find ready market.

At the Oregon State Fair held at Salem this year, Mr. Skovbo took three first prizes and one second for his honey exhibits, which included the grand prize for the best display of its kind at the fair.

Twenty-first Annual Report.

The twenty-first annual report of the Reclamation Service for the fiscal year ended June 30, 1922, is available for distribution.

Under instructions from Congress the reports of the entire Department of the Interior had to be compressed into not more than 1,250 pages, of which only 176 pages were allotted to the report of the Reclamation Service, although these reports have averaged 587 pages for the past five years. This radical cut necessitated careful planning of the material to be included in order to keep within our limit and still present a picture of the essential features of our work. Definite instructions were sent to the projects concerning the amount of space that would be allotted to them, and through their co-operation it is believed that most of the essential features have been preserved, although in abbreviated form.

The report, including the index, comprises 174 pages, and copies may be obtained by writing to the chief clerk, United States Reclamation Service, Washington, D. C.

Recent Service Orders.

CIRCULAR LETTERS.

- | | |
|-------|---|
| No. | |
| 1172. | Irrigation districts. Irrigable areas within districts contracting with United States for payment of project costs. |
| 1173. | Patrolman designation in civil service regulations. |
| 1174. | Amending farm-unit plats. Permanent reduction of irrigable areas. |
| 1175. | Selection of physicians under the provisions of the hospital fund. |
| 1176. | Nonirrigated land on the projects. |
| 1177. | Collection of delinquent accounts. |
| 1178. | Cooperation of the Federal Real Estate Board with the National Association of Real Estate Boards. |
| 1179. | Forms: Order canceling water-right application. |
| 1180. | Small earthwork contracts; advertisement, proposal, and specification. |

DEVELOPING A NEW FARM UNDER IRRIGATION.¹

By Robert S. Stockton.

MANY are the problems in connection with the development of a new farm under an irrigation project. These problems differ from those encountered by the farmer on nonirrigated land. The essential differences arise out of the necessity for having continuous slopes, smooth land, and ditches for conveying water.

The grading and ditching will influence the choice of a location for the farm buildings, cross fences, and other improvements. The necessity of preparing land for irrigation and the requirements of additional labor to farm it properly will limit the amount of land for the most profitable farm unit; and, on new land, it will delay the time when a full return in crops might be expected.

In locating a home on an irrigated farm one should consider, in addition to the topography, roads, etc., the special needs of the place due to the ditches and the work of irrigation. It is desirable that the farmer should be able to irrigate his garden and ground conveniently and with as little interference as possible with the field irrigation operations. The location of the farm buildings has a considerable effect on the cost of irrigating, as well as on the cost of farm work generally. Of two locations one may require many miles of additional travel in doing each year's work. But if the farm house is not on well-drained land, the basement is likely to be damp. Of the two considerations, however, it may be better to drain the land and grade it properly, or even to build a waterproof basement, than to have the home inconveniently situated for carrying on the necessary farm work efficiently. To avoid the dust from automobiles and other traffic, the house should be built well back from the road—much farther back than was formerly customary—but at the same time a good outlook on the road and a view of the surrounding country should be preserved as far as possible.

But there are cases where a favorable location of a homestead can not be made along the lines suggested, or the buildings may have been started by some previous owner and can not well be moved. It then becomes worth while to attack the problem from the other side, and to try so to lay out the ditch system and grade the land as to facilitate the work in this manner.

The next step is to plan both the present and future layout of the buildings and their surrounding groves of trees, gardens, and pastures. Trees should be planted for windbreaks and protection and also to improve the general appearance of the farm. They are

best arranged in groves and small groups so that that outlook to the road may not be hindered and the best possible view over the country is afforded. This produces a more attractive effect than having all the trees in straight lines.

It is no longer considered good form to have wagons, machinery, tin cans, and rubbish strewn promiscuously all over the premises. The thing nowadays is to have some grass and grouped shrubbery in front of the house, and the miscellaneous farm equipment kept in one place hidden by a hedge, with the machinery shed, or at least the site for the machinery shed, at one side. By following out the idea of cleanliness and good order it is possible to have a place that the women folks, children, and strangers will regard as homelike and cozy. Further, if the barn is kept reasonably clean and in good order it is possible to have it closer to the house than would otherwise be the case. This would result in a great saving of time and effort, for suppose there are 10 trips to be made each day by different members of the family from the house to the barn, and we imagine the barn moved 100 feet farther away from the house than is necessary. The extra walking would amount to 200 feet each trip or 2,000 feet each day, or about 136 miles covered needlessly in one year. There is, of course, a happy medium between the man who combines his house and barn under one roof, and the man whose barn is so far away from the house that he meets his son bringing in the milk after supper as he goes out to feed the horses in the morning.

Next to the barn we should have two good corrals and then a small permanent pasture of 5 or 10 acres, and so fixed that it can be irrigated without trouble. In the pasture, or next to it, should be a grove of trees that will eventually provide shelter and shade for the stock. A smaller grove in the big pasture and near the chicken house would also be valuable.

I can hear the practical farmer say: "All this is very fine, but we have something else to do, and the field crops are more important." Quite true, but do not put off tree planting altogether. Do a little at least every year and have a plan to work by.

The big job on a farm that is being brought under irrigation is to grade and smooth the land and put in the ditch system. The extra work of irrigation and the cost of the system and its maintenance demand maximum crop returns if they are to be profitable. Hence the land must be prepared as fast as possible for the big crop yields which can always be had on irrigated land that is properly handled. If

¹ From Irrigation Review.

the land is newly broken, then a grain crop will be planted. Every year after the first some land should be graded, smoothed, and seeded down to alfalfa or mixed grass. In working out a permanent plan regard must be had for the slopes, the soil, the crops to be grown, and the head of water available, and the land then graded for borders, field laterals, or furrows, as may be most suitable and economical.

An attempt has been made to emphasize some of the points to be considered in making a real home and in laying out the farm for economical working. It

is not always possible to have the buildings near the headgate and the highway and on high ground with a fine view and near the center of the land to be worked, but it is worth while to come as near to these ideals as possible. It is essential to success on the irrigated farm that one should begin planting trees and prepare the land for irrigation and that one should have a plan to work by. This plan must include alfalfa, clover, grass crops, and live stock of some kind. If we begin right and then continue along right lines, success will be assured.

THE FARMER AND BETTER BUSINESS.

THE following is from a recent statement by Hon. Henry C. Wallace, Secretary of Agriculture:

When all is said and done, the responsibility for good farming and prosperous farming rests primarily upon the farmers themselves. Through legislation and through administrative action Government can clear the way and see to it that the farmer has an absolutely square deal. Government can and should make available to the farmer the sort of information which he can not acquire for himself but which he needs in order to produce efficiently and with due regard to the needs of the consuming public. Government can help find foreign markets for surplus crops. Government agencies can study marketing methods and point out how they may be improved. But the farmers themselves, acting individually and collectively, must do certain things which they alone can do.

More attention should be given to the choice of crops and live stock which are best adapted to the character of the soil and climate and the opportunities of markets reasonably close at hand. Standardization of crops in communities where soil and climate conditions are fairly uniform will pay big returns. There is room for vast improvement in the grading of products preparatory to marketing. Before farm products reach the consumer they must be sorted and graded. Someone must do this. If the farmers do not do it, either individually or collectively, some one else will, and will charge them a good round price for it. The dumping on the market of the entire crop as it comes from the field is not good business practice. Take the potato crop this year as an illustration. We have apparently a large overproduction of potatoes and there will be a correspondingly low price. If farmers would carefully sort their potatoes and feed to their live stock or dispose of at home the inferior grades and send to market only strictly superior potatoes they would in this way reduce the surplus which goes to the market and depresses the price, and at the same time save the freight and handling charges on the inferior grades which ought to be kept entirely off the market. The same principle applies to all crops.

There is room also for great improvement in the marketing of farm crops and of live stock, both as to the time of marketing and the manner in which it is done. The farmer is the only large producer who produces without informing himself carefully as to future demand; who sells at the price the buyer is willing to pay; who does not condition his products carefully for market; who dumps them in huge quantities soon after produced; and who, therefore, pays high charges of all sorts to other people to do what he ought to do for himself. It is a good deal better for surplus crops to be held on the farms where they are grown, or in warehouses controlled by the farmers at shipping points, than to ship them at once to congested markets where they pile up and become subject to speculation.

Profit from Alfalfa Seed, Umatilla Project.

Mr. R. C. Canfield, a progressive water user on the Umatilla project, Oregon, has furnished us with a statement on the cost per acre of producing and the profits per acre from alfalfa seed, believing that it will prove of interest and value to readers of the RECORD. Mr. Canfield's statement follows:

The cost of producing alfalfa seed on the Umatilla project on a small acreage tract this year is as follows:

	Per acre.
Irrigation once in 15 days for 3 months, 7 irrigations, 2 hours each, 40 cents per hour----	\$5.60
Mowing and stacking, per acre-----	2.00
Thrashing-----	12.00
Water charges, operation and maintenance----	2.00
Interest on investment, 5 per cent on \$200----	10.00
Total cost-----	31.60
Yield, 418 pounds of common alfalfa seed, selling at 23 cents per pound----	\$96.14
Seed was taken off the ground the first week in August, ground irrigated, and on October 15 a crop of hay secured worth above the expense of production-----	5.00
Total income from 1 acre-----	101.14
Profit per acre-----	79.54
Profit this year per acre if Grimm alfalfa seed had been sown and harvested-----	182.40

ADMINISTRATIVE AND STATISTICAL PROGRESS REPORTS FOR NOVEMBER, 1922.

Monthly conditions of principal Reclamation Service reservoirs for November, 1922.

[Elevation above sea level.]

State and project.	Reservoir.	Available capacity in acre-feet.	Elevation.		Storage in acre-feet.			Out-flow in acre-feet.	Elevation of water surface.		
			Spill-way crest. ¹	Lowest gate sill. ²	Begin-ning of month.	End of month.	Maxi-mum.		Begin-ning of month.	End of month.	Maxi-mum.
Arizona, Salt River.....	Roosevelt ³	1,305,000	2128.1	1924.6	516,032	500,122	516,002	15,880	2086.66	2085.04	2086.66
California, Orland.....	East Park.....	51,000	1199.68	1111.68	1,078	1,036	1,270	1,200	1141	1140.72	1142.28
Idaho:											
Boise.....	Arrowrock.....	280,000	3211	2956	10,400	17,584	25,250	37,100	3022.4	3051.6	3066.2
	Deer Flat.....	177,000	2518	2488	9,000	25,575	25,575		2491.7	2496.6	2496.6
Minidoka.....	Lake Wolcott.....	95,180	4245	4236	89,010	89,830	90,530	380,564	4244.47	4244.54	4244.6
	Jackson Lake.....	847,000	6769	6728	265,600	285,930	285,930		6744.1	6745.07	6745.07
Montana:											
Milk River.....	Nelson.....	70,000	2223	2200	29,900	28,400	29,900	195	2213.48	2212.97	2213.48
St. Mary storage.....	Sherburne.....	66,000	4788	4720							
Sun River.....	Willow Creek.....	16,700	4130	4085	11,847	11,847	11,847	180	4124.9	4124.9	4124.9
Nebraska-Wyoming, North Platte.....	Pathfinder.....	1,070,000	5852	5670	249,300	277,480	277,480	1,587	5790.75	5794.53	5794.53
	Lake Alice.....	11,400	4182	4159	8,224	7,699	8,224		4177.6	4176.8	4177.6
	Lake Minatare.....	60,760	4125	4074	40,824	42,671	42,671		4115	4116	4116
Nevada, Newlands.....	Lake Tahoe.....	120,000	6230	6224				21,198	6225.43	6225.22	6225.49
	Lahontan.....	273,600	4162	4060	164,940	179,080	179,080	2,808	4148.4	4150.6	4150.6
New Mexico:											
Carlsbad.....	McMillan.....	45,000	3267.7	3241.6		5,250	5,250		3253.6	3257.7	3257.7
Rio Grande.....	Elephant Butte.....	2,638,000	4407	4231.5	1,501,432	1,464,071	1,501,432	32,278	4373.3	4372	4373.3
Oregon, Umatilla.....	Cold Springs.....	50,000	621.5	560	1,100	1,200	1,200	143	565.59	565.98	565.98
Oregon-California, Klamath.....	Clear Lake.....	462,000	4540	4514	364,000	358,000	364,000		4536.2	4536	4536.2
South Dakota, Belle Fourche.....	Belle Fourche.....	203,000	2975	2920	73,290	93,100	93,100		2954.3	2958.5	2958.5
Utah, Strawberry Valley.....	Strawberry.....	250,000	7558	7517	202,600	204,100	250,000		7551.4	7551.6	7558
Washington:											
Okanogan.....	Conconully.....	14,400	2290	2232	1,775	2,115	2,115		2253.5	2255.3	2255.3
Yakima.....	Bumping Lake.....	34,000	3426	3389	2,737	3,785	3,850	65	3396.3	3394.9	3395
	Lake Cle Elum.....	20,800	2134	2122	8,395	13,210	13,210		2126.7	2129	2120
	Lake Keechelus.....	210,000	2258	2192	31,092	36,470	36,470		2203.9	2205.9	2205.9
	Lake Keechelus.....	152,000	2515	2425	10,708	20,320	20,320		2433.5	2440.9	2440.9
Wyoming, Shoshone.....	Shoshone.....	456,600	5360	5132.3	340,470	339,336	341,013	20,827	5340.8	5340.6	5340.9

¹ Or maximum storage.² Or zero storage.³ Zero water depth at elevation 1902.2.⁴ Amount of silt shown by silt survey deducted from original capacity.⁵ Proposed regulation.⁶ Estimated low-water limit under proposed plan of regulation.⁷ Draft for power purposes.⁸ Elevation of reservoir raised 12 inches by stop logs in spillway.

SALT RIVER PROJECT, ARIZONA.

Water was run in all of the canals during November.

Three regular crews were in the field during the month and accomplished the following maintenance work: 18 miles main canal cleaned, 41 miles laterals cleaned, 82 old structures repaired, 1,076 feet riprap placed, 6 cubic yards concrete placed, and 777 cubic yards earth removed.

In addition, the Ruth dredger bermed 16,900 linear feet, moving approximately 3,400 cubic yards.

The P. & H. one-half yard machine moved approximately 2,000 cubic yards of earth in enlarging Chandler drain. On November 28 this machine was loaded on cars at Chandler and sent to Phoenix, where it will be used in excavating outlet for new drain work at old Cross Cut Canal.

The following construction work was accomplished from maintenance camps: 3.20 miles new waste ditch built, 33 new structures installed, 3,379 cubic yards earth excavation, 33 cubic yards concrete placed, 600 linear feet concrete pipe placed, and 30 linear feet corrugated-iron pipe placed.

The concrete-pipe plant closed down on November 10, having made 600 linear feet of 24-inch concrete pipe.

Work continued on widening Eastern Canal; day and night powder crews drilled 3,472 feet and shot 3,468 feet of holes, average depth 6 feet.

The Monighan 2-yard and Lidgerwood 1½-yard machines moved 12,265 cubic yards of material.

Operation of power system.—Total power generated during month, 3,631,430 kilowatt-hours; maximum daily output (November 28), 153,200 kilowatt-hours; maximum load (November 28), 7,240 kilowatt-hours; maximum daily average load (November 28), 6,380 kilowatt-hours; highest daily load factor, 100 per cent; lowest daily load factor, 59.8 per cent; monthly load factor, 88.2 per cent.

The demand for irrigation water from Roosevelt during the month was such that the capacity of the system was reduced to less than half of full capacity.

The Roosevelt power plant operated 702.7 hours during the month, being shut down on November 30, the south consolidated power plant operated 718.25 hours, the Arizona Falls power plant operated 695 hours, and the Chandler power plant operated 718.67 hours.

Roosevelt river gauge.—A stilling well for the float for this gauge was constructed of 30-inch cement tile. The work of installing the gauge and its accessories was completed except the electrical connections.

At the Cross Cut power plant work was started on the construction of the installation of Tempe motor generators.

Power district No. 7.—A 10 KVA transformer with connections and meter to supply power from the 11,000-volt pump line to the Maricopa County farm was installed and service commenced.—*C. C. Cragin.*

YUMA PROJECT, ARIZONA-CALIFORNIA.

A killing frost was general over the valley November 4, about three weeks ahead of normal. The loss on cotton crop was quite heavy. Project Manager Porter J. Preston was absent from the project November 18 to 27 with the Arizona Engineering Commission on a trip down the Colorado River from Boulder Canyon to Laguna Dam.

Water deliveries were 6,467 acre-feet for the month and 137,720 acre-feet to the end of the month.

The 30-B Bucyrus dragline continued cleaning the main drain, completing 0.9 mile. The four Ruth dredges cleaned 19.2 miles of laterals. The maximum discharge of the Colorado River was 6,400 second-feet; minimum discharge, 4,500 second-feet; total discharge for the month, 326,280 acre-feet. On November 30 the discharge was 5,600 second-feet with a gauge height of 16.07 feet.

Masami Kogo, from Imperial University of Kyoto, Japan, visited the project November 19 and 20.

Mesa division.—The work of remodeling the lock joint pipe plant for the manufacture of pipe in 8-foot lengths was completed.

Contract with J. H. Maxey for earthwork on Mesa B laterals was executed on behalf of the United States on November 18 and a small force began work on B-12-2 lateral and had excavated 800 cubic yards at the end of the month.

The 16-inch Krogh pump was operated 217 hours, pumping 325 acre-feet.—*R. M. Priest.*

ORLAND PROJECT, CALIFORNIA.

The early portion of November was marked by an extended rainstorm, during which 4.18 inches of rain fell at Orland, which is almost twice the monthly mean. Fair weather with cool temperatures prevailed during the remainder of the month.

Concrete lining was continued as weather conditions permitted, an average force of 44 men and 18 head of stock being employed in placing 16,300 square yards of lining. The maintenance force consisting of 16 men and 10 head of stock was engaged in cleaning and repairing 19 miles of concrete-lined sections and 9 miles of earth sections on the distribution system. The gate frame, leaf, stem, and stem guides for the additional auxiliary gate at East Park Dam were installed on the 15th and 16th.

Hearings in connection with the adjudication of the water rights on Stony Creek were resumed on November 13 at Willows, Calif., and continued until November 23, at which time an adjournment was taken until January 4, 1923.—*R. C. E. Weber.*

GRAND VALLEY PROJECT, COLORADO.

November weather conditions were favorable for harvesting crops and all outside work.

Digging of sugar beets was practically completed and all other crops had been harvested. With the exception of apples and potatoes the prices for farm products were satisfactory. Alfalfa hay was in good demand at prices ranging from \$8 to \$12 per ton in the stack, according to the location on the project. Both the yield and the price of sugar beets were satisfactory. The first payment had been made by the Holly Sugar Co. on the basis of \$7 per ton.

Operation and maintenance on the gravity division was confined to miscellaneous repair work on canal and lateral systems. Work was also in progress on seasoning the canyon division of the main canal, by checking the water up to the high water mark, preparatory to carrying an increased flow for the Orchard Mesa district next season.

Drainage construction was continued with two Monighan dragline excavators, one of the machines working the entire month and the second for only the last week. Two thousand one hundred and twenty linear feet of drain were completed, involving 7,700 cubic yards of excavation.

On the Orchard Mesa construction work the excavation for the forebay and the upper end of the siphon under the Colorado River was nearly completed and the erection of forms and placing of steel were in progress. The construction of the temporary railroad bridge was completed. Forms for the barrel of the siphon were built and bending of steel hoops was underway. Work was also started on the excavation for the first 1,000 feet of flume on the Orchard Mesa Canal.—*S. O. Harper.*

UNCOMPAHGRE PROJECT, COLORADO.

The first snowfall of the season occurred on November 4. The total precipitation during the month amounted to 1 inch.

Work was commenced on the building of the G. F. A. lateral, the principal feature of which consisted of the installation of a machine-banded redwood pipe siphon, 14 inches in diameter and 1,114 feet long.

The uncollected water rentals due from the season 1921 on November 30 amounted to approximately \$3,551. The total cash collections to November 30 on account of water rentals for the season 1922 amounted to approximately \$66,000.

There was little demand for irrigation water. The Gunnison Tunnel was operated continuously with a small head from November 3 to November 16, on which date, on account of ice conditions at River Portal, the headgates were closed down for the season.

The ditch riders were employed on alternate days during the forepart of the month in brushing canals and laterals and spading ditches. During the latter part of the month field work necessary in connection with the crop-census survey was begun.

The feeder ditch to the High Line Canal of the South Canal was cleaned and a temporary dam placed in the river in order to permit the carriage of stock and domestic water in this lateral. Repair work to the concrete-lined three-drops section below the Gunnison Tunnel was commenced. The P. & H. drag line continued the cleaning and enlargement work on the Loutsenhizer Canal between the headworks and the North Mesa Lateral head gate, 5,864 cubic yards being excavated. This work necessitated the replacement of one underdrain, two flumes, and one highway bridge.

The car shortage continued critical, and it was estimated, judging from the car movement as compared with car movement during normal years, that from 30 to 35 per cent of the products for this year had been moved to market. As a consequence, all available storage was being used to take care of the crops.—*L. J. Foster.*

BOISE PROJECT, IDAHO.

November weather was clear, cool, and dry. The number of unemployed increased over previous

months owing to the suspension of highway construction and the completion of farm work.

During the first part of the month a large number of potato growers harvested their potatoes and stored them in pits, in hopes that they could be sold by spring. Owing to uncertain market conditions, a large acreage was not harvested. The last of the head-lettuce crop was shipped at good prices, although the yield was light. The demand for hay was good, and the bulk has been sold. Owing to the extreme dry weather, there was little feed available on the ranges, and many of the stockmen began winter feeding.

The run-off from Boise River watershed was below normal. So far the snowfall in the mountains has been extremely light.

Cleaning operations were under way over the entire canal system. The greater part of this work was completed. Frost conditions during the latter part of the month made it necessary to suspend operations except in the sandy areas along Snake River. On the Main Canal about 18,000 cubic yards of sand and gravel which had been washed in from the river during high water was removed. No water was run in the canal system until November 23, when water was turned into the main canal for filling Deer Flat Reservoir.

About 1,000 linear feet of concrete side lining was placed on the main canal. This was on sections where considerable seepage had been taking place.

The Austin dragline excavator was engaged during the entire month on the Upper Mason Creek drain in the Nampa and Meridian irrigation district.

The only field work under way was in connection with operation, maintenance, and drainage work. Two men were engaged on office work in connection with Malheur River investigations, which were being conducted on a cooperative basis between the Reclamation Service, the State of Oregon, and the Warm-springs irrigation district.—*J. B. Bond.*

KING HILL PROJECT, IDAHO.

November was cold and unfavorable for concrete construction. Freezing temperatures were registered every day. Earthwork was delayed more or less by frost.

Government forces moved 40,000 cubic yards of excavation in main canal enlargement with men and teams, making a total of 13 miles enlarged to date. On the lateral system men and teams moved 12,000 cubic yards of material from old and new laterals, in addition to which the P & H 206 dragline excavated 1,000 yards on lateral enlargement and dug up and removed 2,000 lateral feet of old woodstave pipe and completed 3,000 cubic yards of excavation for Lateral 6 siphon. Six thousand lateral feet of backfill were completed for concrete lining; 1,400 lateral feet of 3-inch concrete were placed on the main canal during the month, and this work is 60 per cent complete. A force of 25 men was engaged replacing damaged staves and adding one new stave to the Canyon Creek siphon for enlargement. A force of 10 men was replacing timber turnouts, drops, and checks on the reconstructed laterals the last half of the month. Forms were completed for chute No. 1, lateral 2, and inlet and outlet structures for lateral 4 flume.

Long & Robertson placed 45,150 square feet of 3-inch paving, completing their contract.

Nine small contract outfits moved 30,472 yards of material on enlargement of the Main Canal extension. Schedules 54, 64, 65, 66, 67, and 68 were completed. Temple Bros. had 5 per cent and G. M.

Brown and F. E. Wilson each 33 per cent of their contracts to complete.

Four miles of feeder ditch were cleaned by operation and maintenance forces and rock and brush rip-rap placed at points in the main canal where scour occurred. A considerable number of wooden structures were repaired by this force.

One field party was engaged on construction work throughout the month and one party on lateral location and cross-sections.—*A. M. Rawn.*

Prevailing crop prices at close of November, 1922.

Project.	Alfalfa hay, per ton.		Barley, per bushel.	Oats, per bushel.	Wheat, per bushel.	Potatoes, per bushel.
	In stack.	Baled at shipping point.				
Salt River.....	\$18-\$20	\$22-\$26	\$0.92	\$0.62	\$1.20	.....
Yuma.....	14.00	18.00	.....	.....	.....	.....
Orland.....	13.50	16.50	.62	.....	.99	.....
Grand Valley.....	10.00	13.00	.....	.65	1.10	\$0.35
Uncompahgre.....	7.00	.....	.75	.50	.90	.21
Boise.....	8.00	11.00	.55	.40	.84	.20
King Hill.....	10.00	.....	.....	.....	.....	.36
Minidoka.....	7-8	10-11	.72	.45	.90	.36
Huntley.....	8-9	.....	.....	.....	.....	.....
Milk River.....	7.00	11.00	.36	.40	.99	.30
Sun River.....	10.00	15.00	.70	.60	.96	.30
Lower Yellowstone.....	6-8	10.00	.39	.24	1.01	.30
North Platte.....	8-10	.....	.....	.....	.....	.30
Newlands.....	10.00	14.00	.75	.....	1.20	.....
Carlsbad.....	.....	25.00	.....	.....	.....	.....
Rio Grande.....	.....	20-26	.....	.....	.....	.....
North Dakota pumping.....	12.00	.....	.....	.....	1.16	.50
Umatilla.....	10-11	15-16	.....	.....	.....	.60
Klamath.....	9.00	.....	.72	.64	1.05	.....
Belle Fourche.....	5.00	12.00	.45	.32	.95	.45
Strawberry Valley.....	8.50	12.50	1.00	.75	1.00	.20
Okanogan.....	.....	.....	.....	.....	.....	.60
Yakima.....	.....	13-14	.....	.....	.....	.45
Shoshone.....	10.00	13.50	.....	.....	.79	.25
Indian projects:	.....	.....	.....	.....	.....	.....
Blackfoot.....	10.00	.....	.72	.48	.95	.90
Flathead.....	10.00	15.00	.....	.....	.95	.30
Fort Peck.....	.....	.....	.....	.....	.....	.....

MINIDOKA PROJECT, IDAHO.

November weather was seasonable but dry, the total precipitation being only 0.45 inch.

At Jackson Lake there was a similar shortage in precipitation, so that the inflow from the 1st to the 25th was less than 16,000 acre-feet, whereas during the same time in 1921, the inflow was about 26,000 acre-feet. Lake Walcott was stationary, with an outflow of 380,000 acre-feet.

Harvesting was completed except a small acreage of potatoes that was not dug on account of the low price offered. The potatoes left in the ground were usually of second quality. Prices for all other farm products were fairly good, wheat, oats, and barley especially showing a decided advance. On the 15th the first payment for sugar beets, amounting to about \$177,000, was made by the sugar company. Another payment will be made on December 15. Other payments will follow.

Canal cleaning was carried on throughout the month until the ground froze. It was estimated that two-thirds to three-fourths of the cleaning necessary before next season had been done. The powerhouse was operated without interruption.

A survey for a preliminary location of a canal line from Milner to Black Canyon in connection with the Mountain Home project was made.—*Barry Dibble.*

HUNTLEY PROJECT, MONTANA.

The unfavorable winter weather which prevailed during the early part of November was displaced in the latter part of the month with an exceptionally fine period. Fall plowing and other agricultural work was again possible.

Essential improvement in the financial situation on the project had been forecast, after the harvesting and marketing of this year's heavy crop. In spite of these predictions and an apparent improvement in general business conditions the Huntley State Bank failed to open its doors on November 28. It is the oldest bank on the project, and is the only one to date that has failed to weather the present financial crisis.

Operation and maintenance work was confined to replacing of trap boxes on tile drains, repair work to the pumping plants, completion of water records, and miscellaneous work of a routine nature.

Mr. Hahn and Mr. Wyman, directors of the Lethbridge Northern irrigation district, Lethbridge, Alberta, Canada, visited the project on November 21. On November 22 Mr. W. H. Fairfield, superintendent of the agricultural experiment farm at Lethbridge, Alberta, Canada, visited the project and was much interested in its irrigation developments.—*A. R. McGinness.*

MILK RIVER PROJECT, MONTANA.

November weather was favorable for construction and maintenance. The car shortage improved somewhat, but shipments were still far behind.

Construction by Government forces consisted of excavation and structures on drainage ditch near Dodson; excavation of waste-water ditches near Paisley by drag line and placing a few minor structures. Contractors completed Nelson Reservoir enlargement to 70,000 acre-feet capacity; three contractors on earthwork of lateral extensions completed and three other lateral earthwork contractors, as well as the lateral structure contractor, made indifferent to poor progress.

The operation season closed November 4, 6,000 acre-feet of water having been delivered to users on the Malta and Glasgow divisions. Casting 250 concrete blocks for use in repairs below Dodson Dam was completed and about 75 per cent of the rock required delivered. Painting gates and other metal works and miscellaneous repairs to canals and structures, including placing the system in order for winter, were in progress.—*Geo. E. Stratton.*

ST. MARY STORAGE.

During November there were no severe storms, and as a rule the weather was exceptionally mild and favorable for outside work.

Maintenance work was confined to repairing cribs at Swift Current Creek division and burning drift material on the shore at Sherburne Lakes Reservoir.—*R. M. Snell.*

SUN RIVER PROJECT, MONTANA.

Weather conditions continued favorable for outside work until the last few days of November. Contractors on laterals for the Greenfields division made good progress and about completed the work with the exception of a few small jobs of finishing. The contractors on structures made some progress in excavation and distribution of materials. On the Fort

Shaw division, a small quantity of water was delivered for stock and domestic use. On the Greenfields division work was confined to repairs of Greenfields main canal and a good start made on the extensive improvements that have been decided upon which will make the critical portions of this canal water-tight.

The drag line continued on open drain A and completed 2,915 linear feet of drain, moving 22,746 cubic yards of excavation.

During the month the following shipments were made from the three principal stations: Wheat, 30 cars; alfalfa, 13 cars; potatoes, 6 cars; cattle, 14 cars.—*Geo. O. Sanford.*

LOWER YELLOWSTONE PROJECT, MONTANA-NORTH DAKOTA.

November was unfavorable for maintenance work or farming operations.

Owing to the unfavorable weather conditions and the shortage of laborers, contractors Beauchaine & Klug, and Gene Hoffstot made poor progress. Contractor Henry Swanson made good progress on his work.

The maintenance organization, which was very small, was engaged on the lower end of the project in priming canal and lateral extensions. The Ruth ditch cleaner completed the G system and closed down for the year owing to the frozen material.

The harvesting of all crops other than potatoes was completed. The yield of sugar beets was considerably above the average and returns from this crop were encouraging. It is estimated that the acreage in 1923 will be double that of this year.

The shipment of live stock from the project continued heavy although good authorities have stated that the quantity of live stock in eastern Montana is the lowest that it has been for years.—*L. H. Mitchell.*

NORTH PLATTE PROJECT, NEBRASKA-WYOMING.

Operation and maintenance work during November was at a minimum on account of weather. The Sand Point culvert, on the interstate canal, was under construction and will be pushed to completion as fast as weather conditions permit. One drag line was on excavation and a crew of about 10 men on building forms on this structure. One P. & H. gasoline drag line was cleaning sand out of the first 1½ miles of the Fort Laramie canal.

On the interstate division the interstate canal enlargement with the Monighan drag line was in progress. On the Fort Laramie division two electric Bucyrus drag lines were employed on canal excavation, one Bucyrus electric and one P. & H. gasoline drag line on drainage work, and one Austin gasoline drag line on miscellaneous work in connection with the longer structures. A start was being made on the construction of the Horse Creek siphon for the main Fort Laramie canal. Miscellaneous structure work was being carried on on the Horse Creek lateral system (a 20,000-acre unit). On the Northport division all structure work was being pushed to an early completion and one Bucyrus class 14 drag line was employed on drainage work.

The beet and potato harvest was about completed. Some beets will be left in the ground as the ground was frozen too deep to plow them out. A good many potatoes were left in the ground on account of the market, and there was no market for those dug. Quite a large amount of the potatoes were stored in pits in the field.

Forty-five thousand sheep and 1,300 cattle had been shipped in for feeding.—*Andrew Weiss.*

NEWLANDS PROJECT, NEVADA.

November weather was favorable for project work. There was a small amount of precipitation in the form of rain and a light snow on the 28th. An unusually early season fall of snow was recorded at the Summit Station in the Sierra Nevada Mountains, the depth on the ground on the 10th being 70 inches. This depth diminished to 17 inches on November 30.

A late run of water was made November 1 to 8 for the irrigation of winter grain and alfalfa. This water was largely used in the Stillwater district.

The Lahontan power plant was operated from the Truckee canal during the entire month. Almost the entire flow of the Truckee River was carried in this canal until the 14th to facilitate the installation of a concrete fish ladder by the Indian Service at the Pyramid Lake Indian Reservation diversion dam.

Ditch riders were occupied on completion of the crop census and on maintenance work after November 8.

A foreman and six men and four head of stock were employed on maintenance work, being assisted by ditch riders after the 8th. Vegetation was removed with mowing machines from 19 miles of laterals. Ten miles were grubbed by hand, and stumps were removed from 1 mile of the U lateral. Several minor timber structures were installed and numerous similar structures repaired.

Construction work, aside from drainage, was confined to the reconstructing of the lower bank of the Truckee canal between Stations 838+50 and 841+50, using teams. This work could not be done previously owing to the existence of haystacks, corrals, fences, etc., on the canal right of way. These were removed by court order to allow the work to proceed.

Drainage work was continued with seven drag-line excavators in operation. The upper Soda Lake and Fernley branch A drains were completed. Construction of the Erb drain was commenced. About 207,100 cubic yards of material were removed in this work. Thirty-three timber structures, involving 53,543 feet b. m. of lumber, were installed.

For the placing of new lands on the farm-unit plats irrigable area surveys were made covering about 340 acres north of the Indian reservation near Stillwater. Several other similar surveys were made for the adjustment of farm units under water-right application. Surveys, preparation of maps, etc., were continued covering lands being irrigated with no water right.

The shipment of alfalfa hay in large quantities continued, with the price holding up well.

Shipments of Turkeys for the Thanksgiving market were reported at 150,000 pounds. Many of these birds were being held for the holiday trade.—*D. S. Stuver.*

CARLSBAD PROJECT, NEW MEXICO.

November weather was generally fair during the first half of the month; during the latter half there was considerable cloudy weather, with precipitation of 0.38 inch. Range conditions continued bad and considerable range stock was being pastured on the project farms. The entire flow of the river was stored in Lakes Avalon and McMillan. The regular maintenance foreman, with one or two men, was engaged painting gates and making small repairs throughout the canal and lateral system.

Activity on the farms was confined to picking and ginning the cotton crop. Approximately 5,000 bales of cotton were ginned to December 1. It is estimated that there will be about 1,500 more bales. The price of cotton was somewhat lower during the latter part of the month, and cotton was still selling for prices ranging from 24 to 28½ cents, depending on grade and staple. A large percentage of the cotton crop had been sold and shipped from the project at the end of the month. The price of cottonseed was \$40 per ton. The cottonseed-oil mill at Loving started operation on November 9. About \$30,000 worth of products had been milled. Cottonseed oil was selling for 8 cents per pound, meal for \$45 per ton, and hulls for \$8. Approximately, 9,000 head of sheep and 1,200 head of cattle were being pastured on the farms. About 7,000 head of the sheep are spring lambs, which will be finished for the market. Total repayments on account of construction and operation and maintenance during the month of November amounted to \$11,247.43.—*L. E. Foster.*

RIO GRANDE PROJECT, NEW MEXICO-TEXAS.

Drainage construction continued with the operation of five Bucyrus 9's, one Bucyrus 30-B, and one Monaghan 2-T, all working two shifts. Canal and lateral construction continued with the operation of three Ruth ditching machines on lateral reconstruction and three P. & H. 206 excavators on canal enlargement and new laterals, while a number of small force account team crews were employed raising and straightening old lateral banks.

During the alternate runs of water between the Mesilla and El Paso Valleys by 15-day periods for winter irrigation, advantage was taken of the dry periods in the respective valleys and structure work rushed on canals and laterals.

In the Mesilla Valley 171,500 cubic yards were moved in the construction of 2.2 miles of drain and the deepening of 3½ miles; 15,440 cubic yards were placed in canal and lateral banks, and the two Ruth ditching machines removed 17,700 cubic yards from 7 miles of lateral reconstruction. Three minor structures were installed on drains and 36 on the distribution system over the valley.

In the El Paso Valley 108,950 cubic yards were moved in the construction of 2.2 miles of drain; 0.9 mile of the Lower Franklin canal was reconstructed by the P. & H. excavator moving 27,294 cubic yards; and the Ruth ditching machine removed 11,750 cubic yards from 5.1 miles of lateral on reconstruction; approximately 10,000 cubic yards were moved by team crews. Eight minor structures were installed on drains and 39 on distribution system.

Delays in lumber shipments somewhat handicap the construction work. It seemed impossible to secure cars, and lumber ordered in July and August had not been received.

Since the close of the irrigation season proper on October 15, when the outflow from Elephant Butte Dam was considerably decreased, water for winter irrigation was being run for 15-day periods alternating between the Mesilla and El Paso Valleys. The demands were very light but insistent where wanted. The absence of inflow from the Rio Grande into the reservoir continued.

Cotton was still bringing good prices, and slightly increasing; alfalfa was selling for an average of \$24 a ton, with indications of considerable advance.—*L. M. Lawson.*

NORTH DAKOTA PUMPING PROJECT.

November weather conditions balanced almost exactly on the freezing point as an average.

Maintenance was limited to power house and coal mine. One Curtis turbine was overhauled and a new set of bearings placed. Some repairs were made to power-plant buildings in order that additional space might be suitable for winter operation, and, in general, everything goes into the winter in good shape.

In the coal mine main entries were advanced to the east and north and south entries were turned off, thus blocking out a coal body for the next irrigation season while securing the current supply. Timbering and airways were overhauled.

Commercial power organizations were conducted as usual; 108,000 kilowatt-hours of electrical energy were sold to the city of Williston, which is 2,000 kilowatt-hours less than for the same month of last year.

Nine hundred and three tons of coal were mined.—*Wm. S. Arthur.*

UMATILLA PROJECT, OREGON.

Cloudy weather prevailed throughout November.

The Umatilla River was low and not enough water was available for storage. The only water diverted into the feed canal was for the Echo Mills. There has been little snow fall in the mountains to date. The Hermiston drain was discharging 40 second-feet into the Umatilla River at the end of the month.

A limited amount of hay was shipped. Apple packing was completed and most of the crop was in storage awaiting an improvement in the market. There was little demand for farm products.

On the east division one or two men were employed cleaning brush from the feed canal preparatory to running water and in repairs to buildings. Crop reports and other statistics were gathered. On the west division a small crew was employed on sluicing operations.

The only work in progress were the improvements to the A Canal, resulting in the excavation of 6,000 cubic yards of material and the placing of 885 cubic yards of concrete.

Considerable interest has been taken lately in the reports of geologists that there are oil indications in the vicinity of Hermiston. Already two companies have been formed and drilling outfits have been set up and work commenced. All the likely acreage was leased some time ago.

The annual meeting of the Umatilla County Beekeepers' Association was held during the month, but owing to the small attendance election of officers was postponed until another meeting. Supplies ordered through the association this year showed a saving to members of 10 to 25 per cent.—*H. M. Schilling.*

KLAMATH PROJECT, OREGON-CALIFORNIA.

During November the diversion canal was operated all month diverting water from Lost River to the Klamath River. No water for irrigation was run in any of the project canals.

Nearly all of the project hay crop had been disposed of to stockmen; prices ranged from \$8 to \$10 per ton in the stack. There will be more live stock wintered on the project this year than ever before.

In the Tule Lake division good progress was being made on the construction of the lateral system, also

on the structures for both the canal and lateral system. The laterals were being constructed by drag-line excavators. The canal structures were being built of concrete and the lateral structures of timber. A wood stave flume 8 feet in diameter and 206 feet long was built across Lost River for the J-1 lateral.

In the Langell Valley division fair progress was being made on the diversion dam. On the west side canal about 15,000 cubic yards had been excavated by the contractors on the three lower schedules. Two survey parties were engaged in making a topographic survey of the valley.

A contract has recently been let for extending the Strahorn Railroad from a point above Dairy to Sprague River, a distance of about 10 miles.

On November 14 the Klamath irrigation district made a turnover of \$30,000, thus completing payment of all charges due to date and advancing \$2,305.46 on the construction charge due December 31, 1922.—*Herbert D. Newell.*

Summary of employees for November, 1922.

Projects and offices.	Begin- ning of month.	End of month.	In- crease.	De- crease.
Washington office.....	77	77	.....	.....
Denver office.....	57	57	.....	.....
Field, legal.....	1 17	1 17	.....	.....
Examiners of accounts.....	2	2	.....	.....
Yuma.....	144	141	.....	3
Yuma auxiliary.....	24	21	.....	3
Orland.....	65	72	7	.....
Grand Valley.....	57	66	9	.....
Uncompahgre.....	67	83	16	.....
Boise.....	156	106	.....	50
King Hill.....	253	291	38	.....
Minidoka.....	78	81	3	.....
Huntley.....	11	14	3	.....
Lower Yellowstone.....	20	16	.....	4
Milk River.....	54	58	4	.....
St. Mary storage (includes half time of 6 on Blackfeet).....	17	10	.....	7
Sun River.....	57	50	.....	7
North Platte.....	356	348	.....	8
Newlands.....	112	105	.....	7
Carlsbad.....	13	13	.....	.....
Rio Grande.....	423	453	30	.....
North Dakota pumping.....	26	24	.....	2
Baker.....	46	27	.....	19
Klamath.....	143	132	.....	11
Umatilla.....	80	70	.....	10
Belle Fourche.....	28	14	.....	14
Strawberry Valley.....	41	18	.....	23
Okanogan.....	11	8	.....	3
Yakima.....	154	252	98	.....
Tieton Dam.....	443	456	13	.....
Riverton.....	110	103	.....	7
Shoshone.....	289	261	.....	28
Secondary.....	75	70	4	.....
Unassigned, per diem.....	26	26	.....	.....
INDIAN.				
Flathead.....	180	145	.....	35
Fort Peck.....	14	7	.....	7
Blackfeet (exclusive of half time of 6 on St. Mary).....	22	3	.....	19
Total.....	3,671	3,629	.....	.....

Increase..... 225
Decrease..... 267

Net decrease..... 42

¹ Exclusive of 3 in Denver office.

BELLE FOURCHE PROJECT, SOUTH DAKOTA.

Bad weather during the first half of November and bad roads during all of the month resulted in very

quiet business and very little marketing of produce. The first week was rainy with some snow, and the second week blustery with considerable wind, but no extreme cold. The last ten days or two weeks were warm and open.

Feeding of stock began with the first of the month and will continue until spring, as there is very little value left in the pasture grasses.

Many thousands of head of sheep and cattle have gone through the project and on to Iowa and Nebraska points for feeding, but comparatively few have remained on the project. Some of the farmers have bought small bands of breeding ewes, but lack of credit and insufficient housing equipment has prevented most farmers from securing the stock necessary to consume the surplus forage. Until this condition is changed and all rough feed products are consumed on the farm the farmer will continue to be hard up and his market as well as his income will be uncertain.

With the closing in of bad weather all common labor was laid off and the foremen were employed in taking crop census and doing routine work.—*B. E. Hayden.*

STRAWBERRY VALLEY PROJECT, UTAH.

The first and last parts of November were stormy; the intervening period was cold and clear and favorable for harvesting crops and general farming operations. Precipitation was considerably above the average. The harvesting of all crops was completed and considerable fall plowing was accomplished.

Prices of alfalfa hay, cereals, and live stock advanced somewhat during the month, and still further advance was anticipated.

Repairs to the wasteway and upper plunge basin at the power plant were completed on the 23d.

At the east portal of Strawberry Tunnel the stem to gate No. 5 was replaced and new gate-stem guides for both gates 5 and 6 installed.

The project power plant was in continuous operation, delivering 109,695 kilowatt hours to the several project towns, from which revenues amounting to \$2,125.37 were received.

Collections of construction and operation and maintenance charges progressed slowly, and at the end of the month only 20 per cent had been received.—*W. L. Whittemore.*

OKANOGAN PROJECT, WASHINGTON.

November weather was favorable for such work as was necessary and for the completion of the apple harvest, being generally mild, with little precipitation.

Work for the month consisted of the regular routine office work, with a maintenance crew of four men engaged in putting the irrigation system in shape for the winter, such as draining pipe lines, completing necessary structures, and setting up spillways.

A few men were engaged in mechanical and electrical work and on repairs to machinery and other equipment.

The irrigation system was operated for a few days with a very small head of water for the filling of cisterns.

The car shortage was still holding up the shipment of apples, but at the end of the month the situation was somewhat better. At the end of the month about one-half of the 2,000-car crop had been shipped.—*Calvin Casteel.*

YAKIMA PROJECT, WASHINGTON.

November weather was mild with precipitation below normal. Snowfall at the storage reservoirs amounted to 6 inches at Keechelus, 4 inches at Kachess, $\frac{1}{2}$ inch at Cle Elum, and 3 inches at Bumping, only 1 inch remaining on the ground at the end of the month at Keechelus and Kachess, and none at Cle Elum and Bumping.

Sunnyside division.—Good progress was made on the fall program of maintenance work, weather conditions having been very favorable. A maximum crew of about 150 men and 25 teams was employed on gravel lining, removal of silt, and plowing of berms on the main and branch canals, and on painting of wood siphons on the Benton Canal and lateral 59.31. Some miscellaneous repairs were made on Government buildings, and a well for domestic water supply was put down at Rocky Ford 3-mile patrol quarters. The pumping units at the Outlook, Snipes Mountain, Grandview, and Prosser pumping plants were dismantled and work of overhauling was begun. The equipment on the whole was found in good condition, and no extensive repairs will be needed.

Tieton division.—Diversion was made from the Tieton River between the 22d and 28th for filling cisterns for domestic and stock use. Team crews under the direction of the ditch riders were employed in removing silt from main laterals; repair and replacement of structures on main and sublaterals were handled by two maintenance crews. The cleaning of main laterals was completed prior to running of cistern water. Structure work consisted of replacement of 66 linear feet of 30-inch concrete pipe on the D-1 siphon, replacement of 375 feet of 10-inch concrete pipe in section 3-12-17, installation of 7 concrete head walls with steel gates on turnouts from lateral G, to replace wooden structures, and miscellaneous small jobs. The maximum force was employed about the middle of the month, consisting of 60 men and 20 teams.

Storage reservoirs.—At Keechelus and Kachess the gates remained closed; at Cle Elum a discharge of 172 second-feet was maintained, and at Bumping the gates were open throughout the month. Piling and burning of logs and debris at Keechelus were discontinued on November 21, on account of wet weather which interfered with burning.

On November 18 the Granger irrigation district voted favorably on contract with the United States for construction of its irrigation works, and on November 20 executed the contract. Immediately thereafter orders were placed by the Denver office for materials and equipment and preparations were begun on the project to establish a plant for the manufacture of 33-inch lock joint reinforced concrete pipe for the Granger siphon.—*J. L. Lytel.*

TIETON DAM.

November weather was such that active construction work was carried on throughout the month. Tieton River was unusually low, all of the flow being diverted through the power plant the greater part of the month. The average force employed was 450 men.

There were 115,500 cubic yards of embankment placed. Concrete was placed in the core wall to the amount of 295 cubic yards, completing the season's concreting. Cutting and piling of timber and brush continued in the reservoir area.—*F. T. Crowe.*

RIVERTON PROJECT, WYOMING.

A heavy snowfall occurred on November 2 which greatly interfered with construction work and put the roads in very poor condition. Their condition, however, improved throughout the month and they were in good shape at the end of the month. The unusually low temperature interfered considerably with construction work. The flow of Wind River was about normal and the supply of common labor was about equal to the demand.

On the Wind River diversion dam drag lines 121474 and 121322 excavated 551 cubic yards of material for the weir and collected and screened gravel for concrete. Work was continued placing concrete in the weir, and 1,620 cubic yards of plain and 345 cubic yards of reinforced concrete were placed. Ample cement was received at Riverton, but during the early part of the month it was impossible to deliver a sufficient supply at the dam owing to the very bad condition of the roads.—*H. D. Comstock.*

SHOSHONE PROJECT, WYOMING.

November, 1922, was an abnormal month on the Shoshone project, owing to snowstorms at the close of October and during the fore part of the month. The ground was covered with snow practically the entire month, making roads very heavy and interfering with farm work otherwise.

The foundation for about two-thirds the length of the Willwood Dam was uncovered and the grout holes in this area drilled. Grouting was begun and the concrete plant was completed and a small yardage of concrete placed in the apron the last day of the month. The work and plant are in shape to permit pouring considerable yardage of concrete during December. The class 14 electric drag line moved out of the river bottom after finishing the foundation excavation on the 17th and renewed the work of excavating the Willwood Canal, except for a few shifts stripping the gravel pit at the dam. On the Garfield division drainage work was continued with a Bucyrus class 9½ electric drag line and a P. & H. No. 206 K. C. At the close of the month only the P. & H. No. 206 was in operation; 1.27 miles of drain were constructed. On the Frannie division all machines except the P. & H. class 206 continued on drain excavation, digging 3.58 miles of drain. The P. & H. was forced to close down on the 14th on account of frost.

Owing to the unfavorable weather, crop movement was slow. The alfalfa mills were unable to operate because of poor roads, and damp hay. It was impossible to dig a small acreage of beets and a considerable acreage of potatoes because of frost. The Hennessey Produce Co., of Butte, Mont., operating through the local farmers' exchange, purchased \$12,000 worth of turkeys during the month. The average price was about \$2 per bird. A considerable number of fowls remain on the project for the Christmas market.

Owing to the snow and ice, it was impossible to do much of the usual fall maintenance work, and only a small crew was employed. On the Garland division a few minor structures were replaced and some of the open drains cleaned. On the Frannie division considerable riprap was placed and the Ruth dredger was operated until the 11th; 7,600 linear feet of ditch were cleaned by this machine during that period. The power plant at the Shoshone Dam operated the entire month; 181,500 kilowatt hours were delivered to the transmission line. Of this amount 14,900 kilowatt hours were delivered to commercial

connections and 106,510 kilowatt hours to construction features.—*J. S. Longwell.*

INDIAN PROJECTS, MONTANA.

BLACKFEET PROJECT.

November weather was, as a rule, mild and favorable for construction and maintenance work.

Construction was confined to a small amount of canal excavation and structure paving on Four Horns Outlet Canal.

Maintenance work consisted of cleaning ditches and making minor repairs to banks and structures.

Farm work was confined principally to hauling grain to a shipping point. Shipments were delayed seriously on account of the car shortage.—*R. M. Snell.*

FLATHEAD PROJECT.

November weather conditions were excellent. The first snowfall of the winter came on the 29th, leaving about 5 inches of snow on the ground at the end of the month. Labor was scarce.

At the Hubbard Dam stripping operations continued, a Bagley scraper removing muck and loose rock on the east side of the dam site, and a derrick removing rock shot out of the cut-off trench on the west side of the dam site. The concrete-mixing plant was completed. Hauling of cement was completed for the season.

On the Tabor feed canal the steam shovel advanced 2,730 linear feet in hard material and excavated 17,728 cubic yards. The clearing of right of way advanced 3,650 feet, leaving about one-half mile of right of way to complete the work proposed for this season.

Lateral extension work done by farmers amounted to 12,503 cubic yards of excavation and placing of five culverts.

Operation and maintenance forces completed the usual run of fall maintenance and repair work. A run of stock water was made at the middle of the month to fill up ponds and cisterns.—*E. J. Moody.*

GENERAL OFFICES.

Washington office.—Director Davis was in the field the entire month. On November 1 he left Denver for the Uncompahgre project, where he inspected the Gunnison Tunnel and had conferences with the board of directors of the Uncompahgre Valley Water Users' Association and other prominent water users on the project relative to project conditions. On November 3 he went to the Grand Valley project, where conferences with prominent water users were held on November 4. He returned to Denver on November 5, and on the 7th left for Santa Fe to attend the meeting of the Colorado River Commission, starting on the 9th and continuing to the 24th, when the compact was signed by the representatives of the United States and the seven interested States. From Santa Fe the director went to Los Angeles and Boulder Canyon and returned to the Washington office on December 11.

During the absence of the director the office was in charge of Assistant Director Morris Bien as acting director.

Chief Counsel Ottamar Hamele left for Santa Fe on November 5 to attend the meeting of the Colorado River Commission as the legal adviser of Secretary Hoover, the chairman, and returned to Washington on the 30th.

Statistician Blanchard delivered illustrated lectures before the Woman's Twentieth Century Club, the Army and Navy Club, the American Association of Engineers, the Maryland Grange, and the Trowel Club.

Copies of the Twenty-first Annual Report of the Reclamation Service were received from the printer late in the month, but were withheld from distribution until December 7, after the report of the Secretary had been released to the press.

Publications issued during the month comprised 86 copies of the annual reports and 443 miscellaneous publications. The 30 mimeographed jobs amounted to a total run of 13,730 sheets.

The number of inquiries concerning the service and opportunities for settlement answered by the settlement and information section amounted to 492.

At the end of the month the total number of inquiries from ex-service men concerning opportunities on the land amounted to 195,304.

The photographic laboratory turned out work during the month to the value of \$343.05.

Purchases amounted to \$3,827.65, and the value of requisitions filled and sales from the storehouse amounted to \$2,380.79.

The work in all the divisions of the office was current.

Denver office.—The chief engineer and the director left Denver on November 1 for a visit to the Uncompahgre and Grand Valley projects, returning on November 5. The director left Denver on November 7 for Santa Fe, N. Mex., to attend the meeting of the Colorado River Commission. The chief engineer left Denver on November 12 for an extended field trip. During November he conferred with the engineer in charge of the cooperative investigations in Utah, at Salt Lake City, and visited the Baker, Umatilla, Klamath, Iron Canyon, and Orland projects. Assistant Chief Engineer Charles P. Williams left Denver on November 4 for Washington, D. C., to assist members of the board of review in connection with Milk River project problems. He returned to Denver on November 26. Engineer James Munn left Denver on November 11 and returned on November 26. During

Comparison between operation and maintenance estimates and results, January 1 to November 30, 1922.

Project.	Gross cost.				Net accruals and revenues.				Acreage for which water is available.
	Estimate for 1922.		Actual cost to Nov. 30.	Amount * over or under.	Estimate for 1922.		Actual returns to Nov. 30.	Amount more or * less than estimate.	
	Total for year.	To Nov. 30.			Total for year.	To Nov. 30.			
UNDER PUBLIC NOTICE.									
Belle Fourche.....	\$70,000	\$68,500	\$56,000	\$12,500	\$101,153	\$101,153	\$101,153	.....	84,500
Boise.....	290,000	280,000	235,000	45,000	290,000	289,000	305,000	\$16,000	167,300
Carlsbad.....	52,000	47,500	53,000	* 5,500	56,625	56,625	53,859	* 2,766	25,000
Huntley.....	45,000	42,500	38,700	3,800	46,500	46,500	46,500	.....	30,000
King Hill.....	35,500	(1)	(1)	(1)	* 35,500	(1)	(1)	(1)	16,900
Klamath.....	55,000	54,000	40,300	13,700	* 55,000	54,000	40,300	* 13,700	51,000
Lower Yellowstone.....	36,000	35,000	29,500	5,500	* 36,000	35,000	29,500	* 5,500	40,000
Minidoka (south side).....	94,000	90,000	80,000	10,000	95,300	95,300	101,300	6,000	49,000
Newlands.....	105,000	97,000	98,000	* 1,000	121,000	121,000	123,000	2,000	72,200
North Dakota pumping.....	35,000	33,200	28,500	4,700	* 30,820	30,820	30,820	.....	7,650
North Platte (interstate).....	165,000	(1)	(1)	(1)	166,700	(1)	(1)	(1)	* 130,000
Okanogan.....	37,000	35,500	51,200	* 15,700	* 53,720	52,220	53,720	1,500	8,460
Orland.....	35,000	32,300	30,600	1,700	35,230	35,230	35,600	370	20,500
Rio Grande.....	231,000	215,000	202,000	13,000	* 233,945	217,945	204,945	* 13,000	116,000
Shoshone.....	70,000	68,000	58,000	10,000	75,750	75,750	75,250	* 500	71,100
Strawberry Valley.....	* 25,000	23,000	24,000	* 1,000	* 52,500	52,500	53,000	500	59,100
Sun River (Fort Shaw).....	14,000	13,900	14,100	* 200	15,600	15,600	14,400	* 1,200	13,900
Umatilla.....	37,280	35,400	34,000	1,400	* 37,280	35,400	34,000	* 1,400	24,400
Yakima:									
Sunnyside.....	130,000	120,000	118,000	2,000	148,776	148,776	152,000	3,224	103,000
Tieton.....	84,000	77,000	74,000	3,000	89,800	89,800	87,500	* 2,300	32,000
Yuma.....	260,000	250,000	243,000	7,000	262,000	250,000	252,000	2,000	63,200
Total.....	1,905,780	1,617,800	1,507,900	109,900	2,039,199	1,802,619	1,793,847	* 8,772	1,183,410
UNDER WATER RENTAL.									
Grand Valley.....	50,000	45,000	43,500	1,500	50,800	50,800	46,500	* 4,300	38,400
Milk River (including St. Mary).....	71,500	68,900	55,000	13,900	22,000	22,000	21,000	* 1,000	* 74,000
North Platte (Fort Laramie).....	70,000	(1)	(1)	(1)	53,000	(1)	(1)	(1)	43,400
Sun River (Greenfields and Big Coulee).....	25,000	24,600	25,400	* 800	30,000	30,000	16,500	* 13,200	28,500
Uncompahgre.....	135,000	121,000	130,000	* 9,000	142,500	142,500	140,500	* 2,000	100,000
Total.....	351,500	259,500	253,900	5,600	298,300	245,300	224,800	* 20,500	284,300
INDIAN.									
Blackfeet.....	30,000	29,200	19,000	10,200	19,700	19,700	6,200	* 13,500	21,500
Flathead.....	65,000	63,000	46,500	16,500	58,000	58,000	37,000	* 21,000	105,000
Fort Peck.....	14,600	(1)	(1)	(1)	1,000	(1)	(1)	(1)	22,400
Total.....	109,600	92,200	65,500	26,700	78,700	77,700	43,200	* 34,500	148,900

¹ Report not received from project in time for publication.

² Returns regulated by district contract.

³ Includes 17,000 acres for which water is carried in main canal.

⁴ Not including tunnel repairs.

⁵ Includes installment of \$25,000 for tunnel repairs.

⁶ Stored water is furnished through the St. Mary Canal for 21,600 acres additional.

the month he visited the Baker, Umatilla, Flathead, and Shoshone projects.

The principal work accomplished in the designing section consisted of the following: Made preliminary design and estimates for arch dam at site No. 1 to store 82,500 acre-feet; prepared preliminary designs and estimates for earth and rock fill, also concrete-faced rock fill, to store 82,500 acre-feet, Baker project; also prepared comparative designs and capitalized estimates of cost for concrete and wood stave flume for main canal, capacity of 440 second-feet, Baker project, Oregon; completed detail drawings for both abutments and for power-house section of Black Canyon Dam, and for trash racks and pump-discharge conduit, and made studies for automatic-operating mechanism for drum gates, Black Canyon Dam, Boise project; made preliminary estimates for three heights of dam at each Boulder and Black Canyon sites on the Colorado River; prepared detail designs for various types of construction for upper reaches of Tabor feed canal, and prepared designs for Falls Creek crossing, Tabor feed canal, and preliminary designs for diversion dam from Jocko River to Tabor feed canal, Flathead project; completed detail designs for Colorado River crossing, Orchard Mesa division of the Grand Valley project; prepared detail designs for inlet and outlet structures, wood pipe siphons at stations 9+84, 10+74, 665+02, and 134+15, main canal extension, and completed designs for four siphons and trash-rack structure, various laterals on the King Hill project; prepared detail designs for automatic wasteway for Vandalia Canal, Milk River project; prepared new design for Horse Creek siphon, Fort Laramie main canal, and completed designs for enlarging Red Willow culvert and wasteway, Tri-State Canal, and for construction of Tunnel No. 3, Fort Laramie Canal, and prepared designs for new gate stands and mechanical equipment required for mechanical operation of Interstate and Fort Laramie headworks, North Platte project; prepared designs for transition from lining to earth canal and details of canal lining, Wyoming Canal, and completed design for siphon at station 235 and for steel highway bridge, station 13+20, Wyoming Canal, Riverton project; prepared designs covering repairs to lining on Greenfields main canal, Sun River project, after collecting data on various waterproofing compounds; prepared detail drawing for 33-inch lock-joint concrete pipe in 8-foot units on the Yakima project; prepared preliminary designs and estimates for gravel-fill dam with puddle core, gravel fill with concrete face with various slopes, gravel fill with concrete core walls, multiple arch dam, all for a storage capacity of 73,000 acre-feet, Umatilla project; detail designs for turnout and flumes on various laterals were completed for the Yuma auxiliary project.

The principal work accomplished in the electrical section consisted of the following: Tracings of the 5 by 5 sluice gates for the Black Canyon Dam, Boise project, were completed and pencil drawing of the control-pipe layout for these gates completed; designs for canal structures at the direct pumping plants Nos. 1 and 2, King Hill project, were completed; an inspection of the condition of the outlet tubes in the South Tunnel, Pathfinder Dam, North Platte project, was made by the electrical engineer of this office, in company with Mr. Weiss. Alternative designs for repairing these tubes by means of steel or concrete linings were prepared. A test was made of the 36-inch by-pass valve and 4-inch experimental needle valve

at Shoshone Dam during the month. Alternative estimates for canal enlargement and drainage excavation by means of electric or gasoline operated drag-line excavators were prepared for the Sun River project; consideration was given to the amount of power necessary for the construction of the McKay Dam, Umatilla project; final design of the nozzles for the balanced valves for the Tieton Dam was carried on and detail drawings of the bonnet cover, cylinder head, and cylinder of the emergency valves at Tieton Dam were completed in pencil. Pencil layout of switch-board, conduit, and auxiliaries for the electrification of the Valley drainage plant, Yuma project, were prepared.

The more important matters considered by the legal section were: Release of stock subscription contracts on land within the Harlem irrigation district, Milk River project, and for lands in town lots, Klamath project; formation of proposed irrigation district on the Belle Fourche project; sale of warrants of the Okanogan irrigation district to facilitate payment of construction and operation and maintenance charges, Okanogan project; petition of Nampa and Meridian irrigation district for relief under act of March 31, 1922, Boise project, and transfer of water rights from and to certain lands, Okanogan project. The more important forms of contract considered, prepared, or transmitted were: Proposed contract with Canyon Power Co. in connection with lease of Lahonton power plant and settlement of dispute concerning water rights for proposed Spanish Springs Reservoir, Newlands project; proposed contract with Zillah irrigation district concerning lands to be excluded from Sunnyside Valley irrigation district within town of Zillah, Wash.; proposed contract with Langell Valley irrigation district for construction of Horsefly Reservoir and irrigation of lands east of Lost River, Klamath project; proposed supplemental contract with Elephant Butte irrigation district for additional construction work, Rio Grande project, and contracts with Shasta View, Horsefly, and Sunnyside irrigation districts for sale of water under the Warren Act, Klamath project.

The disbursing section handled 989 vouchers, involving an expenditure of \$252,166.80; and in the purchasing section 365 advertisements were issued, 576 vouchers were prepared, involving a net expenditure of \$184,573.10, and 3,200 rates were furnished for basing purposes.

Carload Shipments from and to Irrigation Projects.

A recent published record of the carload shipments of agricultural products from 11 of the Reclamation Service projects for the season of 1921 shows that 14,000 carloads were shipped from a cropped area of 412,000 acres, or 1 carload to every 29.4 acres.

A recent investigation made by the Western States Reclamation Association shows that during 1920 approximately 19,000 carloads were shipped from 38 States to five of the principal irrigation projects in Idaho and Washington, namely, the Twin Falls South Side, Twin Falls North Side, and Minidoka, Idaho, and the Yakima irrigation district and Naches Valley irrigation district, Washington. This amounts to 1 carload to each 52½ acres of irrigated land.

ADMINISTRATIVE ORGANIZATION.

DEPARTMENT OF THE INTERIOR.

HON. ALBERT B. FALL, Secretary of the Interior.
 EDWARD C. FINNEY, First Assistant Secretary.
 FRANCIS M. GOODWIN, Assistant Secretary.
 EDWIN S. BOOTH, Solicitor for the Interior Department.
 CHARLES V. SAFFORD, Administrative Assistant to the Secretary.
 MORGAN R. BROCK, Assistant to the Secretary.
 HARRY G. CLUNY, Private Secretary to the Secretary.
 JOHN HARVEY, Chief Clerk and Superintendent of Buildings.

U. S. RECLAMATION SERVICE.

WASHINGTON, D. C.

Arthur Powell Davis, director; Morris Blen, assistant director; Ottomar Hamele, chief counsel; J. B. Beadle, director's assistant; C. J. Blanchard, statistician; Hugh A. Brown, editor and office assistant; C. A. Bissell, engineer; J. M. Luney, chief accountant; C. A. Lyman, repayment accounting; Miss H. A. Fellows and Raymond Depue, fiscal agents; C. H. Fitch, chief clerk; Emmet Carr, purchasing agent; G. W. Numbers, appointment clerk; H. N. Bickel, Yakima, Wash., and W. F. Kubach, Denver, Colo., examiners of accounts.

DENVER, COLO.

F. E. Weymouth, chief engineer, Wilda Building, Denver, Colo.; R. F. Walter and C. P. Williams, assistant chief engineers; Miss L. H. Melsel, secretary to the chief engineer; J. M. Gaylord, electrical engineer; J. L. Savage, designing engineer; James Munn, engineer; W. A. Meyer, chief clerk; A. McD. Brooks, purchasing agent; Harry Caden, fiscal agent.

FIELD LEGAL OFFICES.

Boise, Idaho.—B. E. Stoutemyer, district counsel. Projects: Boise, Minidoka, King Hill, and Jackson Lake Enlargement.

Denver, Colo.—Law section office of chief engineer: R. M. Patrick and Armand Olufft, district counsel.

Las Cruces, N. Mex.—Mark B. Thompson, attorney. Projects: Rio Grande, Carlsbad, and Hondo.

Helena, Mont.—E. E. Roddis, district counsel, Helena, Mont. Projects: Blackfeet, Flathead, Fort Peck, Huntley, Milk River, St. Mary Storage, Sun River, North Dakota Pumping, Lower Yellowstone, and Shoshone.

Mitchell, Nebr.—J. N. Beardslee, district counsel. Projects: North Platte, Belle Fourche, and Riverton.

Montrose, Colo.—J. R. Alexander, district counsel. Projects: Grand Valley, Uncompahgre, and Strawberry Valley.

Portland, Oreg.—H. L. Holgate and D. G. Tyree, district counsel. Projects: Yakima, Okanogan, Umatilla, Klamath, and Baker.

San Francisco, Calif.—P. W. Dent and Brooks Fullerton, district counsel, 349 Pacific Building. Projects: Salt River, Yuma, Orland, and Newlands.

PROJECT ORGANIZATION.

Belle Fourche Project.—B. E. Hayden, project manager, Newell, S. Dak.; R. C. Walber, chief clerk.

Boise Project.—J. B. Bond, project manager, Boise, Idaho; Walter Ward, engineer in charge construction Black Canyon Dam; E. R. Mills, chief clerk; C. F. Weinkauff, fiscal agent.

Carlsbad Project.—L. E. Foster, project manager, Carlsbad, N. Mex.; V. L. Minter, chief clerk and fiscal agent.

Grand Valley Project.—S. O. Harper, project manager, Grand Junction, Colo.; W. J. Chiesman, chief clerk; A. H. Hall, fiscal agent.

Huntley Project.—A. R. McGinness, project manager, Ballantine, Mont.; G. H. Bolt, chief clerk; Miss M. C. Simek, fiscal agent.

King Hill Project.—A. M. Rawn, project manager, King Hill, Idaho; T. W. Hause, chief clerk; W. S. Gillogly, fiscal agent.

Klamath Project.—H. D. Newell, project manager, Klamath Falls, Oreg.; N. G. Wheeler, chief clerk; G. R. Barnhart, fiscal agent.

Lower Yellowstone Project.—L. H. Mitchell, project manager, Savage, Mont.; C. A. Denman, chief clerk.

Milk River Project.—G. E. Stratton, project manager, Malta, Mont.; H. A. Parker, engineer; E. E. Chabot, chief clerk; G. S. Moore, fiscal agent.

Minidoka Project.—Barry Dibble, project manager, Burley, Idaho; Dana Templin, engineer; E. C. Diehl, chief clerk; Miss A. J. Larson, fiscal agent; F. A. Banks, engineer, American Falls, Idaho.

Newlands Project.—J. F. Richardson, project manager, Fallon, Nev.; A. W. Walker, engineer; G. B. Snow, chief clerk; Miss Ethel M. Simmonds, fiscal agent.

North Dakota Pumping Project.—W. S. Arthur, project manager and chief clerk, Williston, N. Dak.; H. C. Melaas, fiscal agent.

North Platte Project.—Andrew Weiss, project manager, Mitchell, Nebr.; H. W. Bashore, engineer, Fort Laramie Division; Paul Rothi, irrigation manager; J. R. Ummel, chief clerk; Mrs. A. L. Truax, fiscal agent.

Okanogan Project.—Calvin Casteel, project manager, Okanogan, Wash.; W. D. Funk, chief clerk and fiscal agent.

Orland Project.—R. C. E. Weber, project manager, Orland, Calif.; E. T. Eriksen, engineer; C. H. Lillingston, chief clerk and fiscal agent.

Rio Grande Project.—L. M. Lawson, project manager, El Paso, Tex.; T. W. Parry, irrigation manager; C. A. Peavey, chief clerk; L. S. Kennicott, fiscal agent.

Riverton Project.—H. D. Comstock, project manager, Riverton, Wyo.; R. M. Conner, engineer; G. H. Murphy, chief clerk; W. J. Fogarty, fiscal agent.

St. Mary Storage Division.—R. M. Snell, project manager, Brownling, Mont.; F. H. Shiner, chief clerk and fiscal agent.

Salt River Project.—Being operated by the Salt River Valley Water Users' Association; C. C. Cragin, general superintendent and chief engineer, Phoenix, Ariz.

Shoshone Project.—J. S. Longwell, project manager, Powell, Wyo.; J. R. Iakisch, engineer; C. M. Jump, superintendent of irrigation; W. F. Sha, chief clerk; Miss L. C. Drinkwater, fiscal agent.

Strawberry Valley Project.—W. L. Whittemore, project manager, Provo, Utah; J. E. Overlade, chief clerk and fiscal agent.

Sun River Project.—G. O. Sanford, project manager, Great Falls, Mont.; H. W. Johnson, chief clerk; G. A. Benjamin, irrigation manager, Fairfield, Mont.

Umatilla Project.—H. M. Schilling, project manager, Hermiston, Oreg.; G. C. Patterson, chief clerk and fiscal agent.

Uncompahgre Project.—L. J. Foster, project manager, Montrose, Colo.; R. B. Smith, chief clerk; F. D. Helm, fiscal agent.

Yakima Project.—J. L. Lytel, project manager, Yakima, Wash.; R. K. Cunningham, chief clerk; J. C. Gawler, fiscal agent; M. D. Scroggs, superintendent of irrigation, Sunnyside, Wash.; J. S. Moore, superintendent of irrigation, Route 6, Yakima, Wash.; F. T. Crowe, engineer in charge construction Tieton Dam, Rimrock, Wash.; W. C. Christopher and C. F. Gleason, engineers; V. G. Evans, chief clerk; C. B. Funk, fiscal agent.

Yuma Project.—P. J. Preston, project manager, Yuma, Ariz.; R. M. Priest, superintendent of construction; D. C. McConaughy, engineer, Yuma Mesa Division; E. R. Scheppelmann, chief clerk; E. M. Phillebaum, fiscal agent.

INDIAN PROJECTS.

Blackfeet Project.—R. M. Snell, project manager, Browning, Mont.; F. H. Shiner, chief clerk and fiscal agent.

Flathead Project.—C. J. Moody, project manager, St. Ignatius, Mont.; S. A. Kerr, engineer in charge construction Hubbard Dam; J. M. Swan, chief clerk; J. P. Siebeneicher, fiscal agent.

Fort Peck Project.—E. L. Decker, acting project manager, Poplar, Mont.; Henry Berryhill, chief clerk and fiscal agent.

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v. 13

INDEX.

RECLAMATION RECORD, VOLUME XIII.

FOR THE YEAR 1922.

Page numbers for separate issues.

No.	Month.	Page.	No.	Month.	Page.
1.	January.....	1-20	7.	July.....	157-192
2.	February.....	21-40	8.	August.....	193-212
3.	March.....	41-64	9.	September.....	213-240
4.	April.....	65-92	10.	October.....	241-268
5.	May.....	93-116	11.	November.....	269-300
6.	June.....	117-156	12.	December.....	301-336

A.

	Page.
Abandonment of water right in Idaho.....	256
Administrative and statistical progress reports.....	8, 28, 52, 80, 102, 144, 181, 203, 231, 258, 290, 326
Agriculture, reclamation provisions in appropriation act for Department of.....	143
Alfalfa hay, dairy cows increase value of.....	137
later cutting of, found to be better practice....	219
live stock on Reclamation Service projects offers most profitable medium for marketing.....	193
on the Newlands project, Nevada, report on the estimated cost of producing.....	72
seed, Umatilla project, profit from.....	325
Alkali land on Reclamation Service projects, report on experimental investigations on the use of aluminum sulphate on.....	4
Aluminum sulphate on alkali land on Reclamation Service projects, report on experimental investigations on the use of.....	4
sulphate on hard soils, Newlands project, progress report on use of.....	75
American homes and increased prosperity, more....	282
Ames Realty Co., Mettler <i>v.</i>	49
Anniversary message from Secretary Albert B. Fall, an.....	117
Announcements, recent Reclamation Service orders and.....	39
Annual water charges on Federal irrigation projects, seasons of 1921 and 1922.....	79
Antioch case, the.....	140
Appropriation act for Department of Agriculture, reclamation provisions in.....	143
Appropriations for Reclamation Service.....	142
in South Dakota prior to 1881.....	49
Arnold et al. <i>v.</i> United States.....	230
Assessment of railroad property in drainage districts.	100
Aswan dam, Egypt, data on the.....	252
Atchison <i>v.</i> Peterson.....	174
Aupperle, D. W., The Grand Valley project.....	119

B.

	Page.
Baker, Swigert <i>v.</i>	26
Basey <i>v.</i> Gallagher.....	174
Bean, Morris <i>v.</i>	177
Bean <i>v.</i> Morris.....	175, 177
Belle Fourche project crop report, 1921.....	110
project irrigation has helped materially in producing these results.....	178
project, the.....	124
Bergin, Frank J., Annual water charges on Federal irrigation projects, seasons of 1921 and 1922.....	79
Bills relating to Federal reclamation.....	26, 50, 78, 143, 177, 230, 257
Bissell, C. A., Report on hydraulic problems of the Colorado River.....	41
Bitter Creek case, the.....	140
Black Canyon Irrigation District lands set record...	172
Blackfeet (Indian) project, irrigation on the.....	125
Blanchard, C. J., Current comments.....	214
Short stories of successful settlers.....	242, 271, 306
The-end-of-the-rainbow ranch.....	250
Board of Supervisors of Madera County et al., Miller & Lux <i>v.</i>	288
Boise project crop report, 1921.....	55
project, the, 1904-1922.....	120
Bond, New York Canal Co. <i>v.</i>	26
Bonded indebtedness, obligations of Washington Irrigation Districts on account of.....	256
Border irrigation rapidly growing in public favor...	219
Boulder Canyon, daylight saving at.....	51
Boundary drainage pumping plant, report on, Yuma project.....	21
Boyle, State <i>v.</i>	141
Boys' and Girls' Club work.....	278
Bridge, George M., The Yuma irrigation project....	118
Broder <i>v.</i> Water Co.....	174
Brown et al., United States <i>v.</i>	141
Brown (Wash.), Leiser <i>v.</i>	256
Bureau, a new.....	249

	Page.		Page.
Burkholder, J. L., Drainage works on irrigation projects constructed by the United States Reclamation Service.....	170	Cowan v. Lineberger.....	201
Business, the farmer and better.....	325	Cox, District Counsel, resigns.....	230
C.		Cragin, C. C., Water measurements on the Salt River project.....	329
California Irrigation District Act held unconstitutional, part of.....	288	Crags Land Co. et al., Rindge et al. v.....	260
Canal head gates, rating curves for.....	97	Craig v. White.....	49
Canals, report on cleaning, with modified disk harrows, Minidoka project, Idaho.....	22	Crawford, Hugh L., Report on cleaning canals with modified disk harrows, Minidoka irrigation project, Idaho.....	22
Carload shipments from and to irrigation projects..	335	Crippen v. White.....	174
Carlsbad project crop report, 1921.....	34	Crop reports, 1921:	
project, the.....	122	Belle Fourche project.....	110
Carpenter, Farm Investment Co. v.....	174	Boise project.....	55
Central Lumber Co. v. City of Waseca et al.....	229	Carlsbad project.....	34
Channels of navigable streams.....	200	Grand Valley project.....	146
Chase et al., Osborn et al. v.....	201	Hantley project.....	149
Chief counsel, Reclamation law notes.....	5, 25, 49, 76, 100, 140, 173, 200, 228, 256, 286, 302	King Hill project.....	31
City of Trinidad, Pulaska Irrigation Ditch Co. v...	49	Klamath project.....	87
City of Waseca et al., Central Lumber Co. v.....	229	Lower Yellowstone project.....	84
Clark et al. v. Hansen.....	201	Milk River project (exclusive of Chinook and St. Mary Divisions).....	32, 33
Cline, L. E., Profits of dairy industry revealed through herd testing.....	313	Minidoka project, Gravity Division.....	148
Cloudburst, spectacular, on Flathead project.....	267	South Side Pumping Division.....	147
Coefficients of discharge for suppressed submerged orifices.....	253	Newlands project.....	108
Collection of assessments by water users association in Idaho.....	201	North Dakota Pumping project (Williston Division).....	35
Collins v. Left Hand Ditch Co.....	174, 176	North Platte Canal and Colonization Co., North Platte project.....	13
Colorado, Kansas v.....	175	North Platte project, Fort Laramie Division ..	13
Colorado River compact.....	302	Interstate Division.....	12
Colorado River, report on hydraulic problems of the.	41	Okanogan project.....	187
Colorado Springs, Strickler v.....	174	Orland project.....	9
Colorado, Wyoming v.....	173, 257	Rio Grande project.....	108
Columbia, Irrigation District of Stevens County et al., Supreme Court of the State of Washington in State ex rel Clancy et al. v.....	256	Salt River project.....	29, 291
Committee on Business Methods, report of.....	7	Shoshone project, Frannie Division.....	17
Conant v. Deep Creek Irrigation Co.....	177	Garland Division.....	18
Condemnation of land for town site in aid of Federal irrigation project.....	141	Strawberry Valley project.....	111
Construction accounts, delinquent, on Flathead project not subject to penalties.....	7	Sun River project, Fort Shaw Division.....	106
charge for Yuma project again upheld.....	25	Greenfields Division.....	107
reports. 8, 23, 52, 80, 102, 144, 181, 293, 231, 258, 290,	326	Umatilla project.....	86
Cook v. Evans.....	49	Yakima project, Sunnyside Division.....	60
Cooley, A. C., Report on the estimated cost of producing alfalfa on the Newlands project, Nevada.....	72	Tieton Division.....	61
the importance of yield in the economical producing of sugar beets on Reclamation Service projects.....	168	Yuma project.....	145
Core walls for earth and rockfill dams.....	197	Crop reports on reclamation projects in 1921, summary of.....	97
Cost and crops.....	156	Crops, cost and.....	156
of drainage construction, Newlands project, report on.....	75	on Milk River project; dry-farmed and irrigated.	97
		Cultivation versus irrigation.....	177
		Current comments, gathered from the project press and people.....	214
		D.	
		Dairy cows increase value of alfalfa hay.....	137
		farmers need to cooperate, ten reasons why....	219
		herds, statistics concerning Newlands project..	115
		Damage on account of shortage of water.....	201
		Damages to horse on Yuma project, Government not liable for.....	78

	Page.		Page.
Dams, core walls for earth and rock fill.....	197	Farm loans on Federal irrigation projects, irrigation districts and.....	100
Daylight saving at Boulder Canyon.....	51	Farmer and better business, the.....	325
Decker, Willey <i>v.</i>	174, 176, 177	Farmers' Irrigation District case in Nebraska.....	228
Deep Creek Irrigation Co., Conant <i>v.</i>	177	Farmers' Irrigation District, New York Trust Co. <i>v.</i>	229
Design, construction, and life of metal flumes, report on the.....	65	Federal irrigation projects, annual water charges on, season of 1921 and 1922.....	79
Designations for Reclamation Service projects, approved divisions.....	27	"Final settlement" under Government contracts..	230
Developing a new farm under irrigation.....	324	Finn <i>v.</i> Saffer.....	256
Dietz, Edmund, On the eastern slope of the high Sierras, Newlands project.....	122	Flathead (Indian) project, delinquent construction accounts on not subject to penalties.....	7
Disabled soldier entrymen, patents to.....	78	project, irrigation has helped materially in producing these results.....	180
Ditch cleaning harrow for removing moss and weeds from canals and laterals, King Hill project, Idaho.....	196	project, spectacular cloudburst on.....	267
Ditches to avoid waste, construction of.....	201	project, the.....	126
Division designations for Reclamation Service projects, approved.....	27	project, the Little Bitter Root Valley.....	202
Dodd, E. P., Development of the Umatilla project.....	123	Flumes, report on the design, construction and life of metal.....	65
Drain cleaning, Rio Grande project.....	283	Fort Laramie Division, North Platte project, crop report, 1921.....	13
Drainage construction, Newlands project, report on cost of.....	75	Frannie Division, Shoshone project, crop report, 1921.....	17
costs as operation and maintenance, collection of.....	286	Fort Morgan Reservoir & Irrigation Co. <i>v.</i> McCune..	201
works on irrigation projects constructed by the United States Reclamation Service.....	170	Fort Shaw division, Sun River project, crop report, 1921.....	106
Drains on Reclamation Service projects, report on an engineering investigation on the maintenance of.....	1	Fowler <i>v.</i> Wood.....	200
E.		G.	
Eaton, Hoge <i>v.</i>	177	Gallagher, Basey <i>v.</i>	174
Egleston, Willis J., 1872-1922.....	51	Garland Division, Shoshone project, crop report, 1921.....	18
Electric power on Salt River project.....	257	Gasoline, payment by government of State tax on..	288
Engineering investigation on the maintenance of drains on Reclamation Service projects, report on an.....	1	Georgia <i>v.</i> Tennessee Copper Co.....	175
library of the United States Reclamation Service, the.....	137	Goff, W. P., Irrigation on the Blackfeet (Indian) project.....	125
Englebrecht, Haaser <i>v.</i>	49	Government contracts, "final settlement" under..	230
Entry under the Reclamation Law, rights of.....	50	Grand Valley project, Colorado, Irrigation has helped materially in producing these results.....	178
Entrymen, incapacitated soldier, to receive patents.....	26	project crop report, 1921.....	146
Erlandson, Henry, What the Strawberry Valley project has done for Payson.....	124	project, the.....	119
Evans, Cook <i>v.</i>	49	Gravity Division, Minidoka project, crop report, 1921.....	148
Experimental investigations on the use of aluminum sulphate on alkali land on Reclamation Service projects.....	4	Greenfields Division, Sun River project, crop report, 1921.....	107
F.		Guiraud, Thomas <i>v.</i>	174, 176
Fairchild, Payette-Boise Water Users' Association (Ltd.) <i>v.</i>	201	H.	
Fairs, reclamation project.....	245	Haaser <i>v.</i> Englebrecht.....	49
Fall, Secretary Albert B., An anniversary message from.....	117	Haga, United States <i>v.</i>	49
Farm Investment Co. <i>v.</i> Carpenter.....	174	Hamele, Ottamar, Reclamation law notes.....	5,
		25, 49, 76, 100, 140, 173, 200, 228, 256, 286, 302	
		Hammond <i>v.</i> Rose.....	176
		Hansen, Clark et al. <i>v.</i>	201
		Harrows, report on cleaning canals with modified disk, Minidoka irrigation project, Idaho.....	22
		Harwell, Roland, The Rio Grande project.....	123

	Page.		Page.
Hinds, Julian, Coefficients of discharge for suppressed submerged orifices.....	253	K.	
Rating curves for canal head gates.....	98	Kansas City Southern Ry. Co., <i>Thomas v.</i>	100
Report on the design, construction, and life of metal flumes.....	65	Kansas <i>v. Colorado</i>	175
Hints from a practical farmer:		Kelly, Amos, Some results on the Milk River project.....	121
Alfalfa, later cutting of, found to be better practice.....	219	Kern River Co. right of way canceled.....	26
Border irrigation rapidly growing in public favor.....	219	Kern River Co. <i>v. United States</i>	26
Dairy farmers need to cooperate, ten reasons why.....	219	Kihlberg <i>v. United States</i>	26
Lime and phosphorus are vital to dairy animal..	312	King Hill project crop report, 1921.....	31
Poultry farmers, practical suggestions for.....	311	project ditch cleaning harrow for removing moss and weeds from canals and laterals....	196
Profits of dairy industry revealed through herd testing.....	313	project, effect of irrigation on the.....	121
Silos and silage.....	218	project, irrigation has helped materially in producing these results.....	138
Good reasons for building.....	218	Kirk, E. A., Results of reclamation at Orland, Calif.....	319
Success-controlling factors in cooperation outlined.....	313	Klamath project crop report, 1921.....	87
Hoge <i>v. Eaton</i>	177	project, Tule Lake Division, farms open to entry.....	285
Hogue, G. H., The Boise project, 1904-1922.....	120	L.	
Honor roll.....	281, 317	Land for town site in aid of Federal irrigation project, condemnation of.....	141
Horne <i>v. Utah Oil Refining Co.</i>	50	Larimer and Weld Irrigation Co., <i>Wyatt v.</i>	174
Howell, C. H., Core walls for earth and rock fill dams.....	197	Law notes:	
Howell <i>v. Johnson</i>	177	Abandonment of water right in Idaho.....	256
Hulett, Taylor <i>v.</i>	177	Antioch case, the.....	140
Huntley project crop report, 1921.....	147	Appropriation of water in Washington.....	256
project, irrigation has helped materially in producing these results.....	94	Appropriations for Reclamation Service.....	142
I.		Appropriations in South Dakota prior to 1881..	49
Ide et al., United States <i>v.</i>	140	Arizona Irrigation District law constitutional..	230
Illinois, Missouri <i>v.</i>	175	Assessment of railroad property in drainage district.....	100
Interstate Division, North Platte project, crop report, 1921.....	12	Bills relating to Federal reclamation.....	26, 50, 78, 143, 177, 230, 257
Ireland, H. A., Boys' and Girls' Club work.....	278	Bitter Creek case, the.....	140
Irrigation, cultivation versus.....	177	Channels of navigable streams.....	200
developing a new farm under.....	324	Collection of assessments by water users association in Idaho.....	201
District <i>v. Water Users' Association</i>	288	Collection of drainage costs as operation and maintenance.....	286
districts and farm loans on Federal irrigation projects.....	100	Colorado River compact, the.....	302
easements.....	230	Condemnation of land for town site in aid of Federal irrigation project.....	141
has helped materially in producing these results.....	93, 138, 178	Construction accounts, delinquent, on Flathead project not subject to penalties.....	7
investigation in Nebraska.....	257	Construction charge for Yuma project again upheld.....	25
practice, some odds and ends of.....	194	Construction of ditches to avoid water.....	201
statistics concerning some of the results of, on the Milk River project, Montana.....	48	Damage on account of shortage of water.....	201
Irwin <i>v. Webb</i>	100	Damages from oil mixing with irrigation water	50
J.		Delivery of water by irrigation district.....	201
Johnson, Howell <i>v.</i>	177	District Counsel Cox resigns.....	230
Johnston <i>v. Little Horse Creek Irrigating Co.</i>	174	Electric power on Salt River project.....	257
Joyce et al. <i>v. Murphy Land & Irrigation Co. et al Idaho</i>	256	Farmers' Irrigation District case in Nebraska..	228
		"Final settlement" under Government contracts.....	230

INDEX.

V

	Page.		Page.
Law notes—Continued.		Live-stock carrying capacity of acreage devoted to hay and forage crops on Reclamation Service projects, statistics on.....	24
Government not liable for damages to horse on Yuma project.....	78	on Reclamation Service projects offers most profitable medium for marketing alfalfa.....	193
Informal application for telephone service.....	141	Lock-joint concrete pipe, manufacture and installa- tion of precast.....	223
Irrigation districts and farm loans on Federal irrigation projects.....	100	Longwell, J. S., Report on closing 42-inch outlet pipes in Shoshone Dam.....	45
Irrigation easements.....	230	Lounsberry, C. E., Report on an engineering inves- tigation on the maintenance of drains on Reclama- tion Service projects.....	1
Irrigation investigation in Nebraska.....	257	Lower Yellowstone project, crop report, 1921.....	84
Kern River Co. right of way canceled.....	26	Mc.	
Mathiot, Mrs. G. B., admitted to bar.....	50	McClanahan, Dr. A. C., Eleven years of reclama- tion on the Uncompahgre project.....	120
Montana Irrigation Co. not a public utility.....	141	McConaughy, D. C., Report on the boundary drain- age pumping plant, Yuma project.....	21
Navigability of rivers.....	200	McCune, Fort Morgan Reservoir & Irrigation Co. v..	201
Obligations of Washington Irrigation Districts on account of bonded indebtedness.....	256	McKay, Surrage v.....	201
Parol license for irrigation ditch in Colorado...	256	M.	
Part of California Irrigation District Act held unconstitutional.....	238	Mathiot, Mrs. G. B., admitted to bar.....	50
Patents to disabled soldier entrymen.....	78	Mettler v. Ames Realty Co.....	49
Payment by Government of State tax on gaso- line.....	288	Midwest Refining Co., Sussex Land & Live Stock Co. v.....	50
Proceeding to test legality of irrigation district organization in Utah.....	201	Milk River project, dry-farmed and irrigated crops on.....	97
Reclamation provisions in appropriation act for Department of Agriculture.....	143	project crop report, 1921.....	32, 33
Relief to water users on Federal irrigation pro- jects.....	76	project, increased application for the Venturi flume.....	284
Rights of entry under the reclamation law....	50	project, some results on the.....	121
Rights to spring on homestead entry.....	256	project, statistics concerning some of the results of irrigation on the.....	48
Riparian doctrine definitely discarded in Mon- tana.....	49	Miller and Lux, Rickey Land and Cattle Co. v....	175
Riparian rights in California.....	200	Miller and Lux v. Board of Supervisors of Madera County et al.....	288
Riparian rights in South Dakota.....	49	Miller, Gordon P., The Sunnyside Division of the Yakima project.....	125
Seepage, liability of Government for.....	5	Minidoka project, Gravity Division, crop report, 1921.....	148
Soldier, incapacitated, entrymen to receive patents.....	26	project, irrigation has helped materially in pro- ducing these results.....	93
Taxation of public land.....	100	project, J. D. Remsberg speaks up for the....	305
Transfer of irrigation water in Washington....	201	project, report on cleaning canals with modified disk harrows.....	22
Traveling expenses of Government employees....	49	project, South Side Pumping Division, crop report, 1921.....	147
Title to lands bordering lake in California....	49	project, the.....	121
Use of percolating water in Utah.....	50	Missouri v. Illinois.....	175
Use of seepage from drainage ditch reservoir in Colorado.....	201	Montana Irrigation Co. not a public utility.....	141
Use of sewage water in Colorado.....	49	Montgomery, A. B., Effect of irrigation on the King Hill project.....	121
Use of waste and seepage waters.....	49	Monthly progress reports.....	8, 28, 52, 80, 102, 144, 181, 203, 231, 258, 290, 326
Water rights in South Dakota.....	6	More, B. A., The Little Bitter Root Valley, Flathead (Indian) project.....	202
What is public purpose?.....	229	Morris, Bean v.....	175, 177
Wyoming v. Colorado.....	173, 257		
Left Hand Ditch Co., Collins v.....	174, 176		
Left Hand Ditch Co., Oppenlander v.....	174, 176		
Legality of irrigation district organization in Utah, proceeding to test.....	201		
Leiser v. Brown (Washington).....	256		
Lime and phosphorus are vital to dairy animal....	313		
Lineberger, Cowan v.....	201		
Little Bitter Root Valley, Flathead (Indian) proj- ect, the.....	202		
Little Horse Creek Irrigating Co., Johnston v.....	174		
Littlepage, Mrs. Louella, Project women and their interests.....	220, 246, 276, 314		

	Page.		Page.
Morris v. Bean.....	177	Orme, John P., What reclamation has done for the Salt River Valley.....	118
Moss and weeds from canals and laterals, ditch cleaning harrow for removing, King Hill project, Idaho.....	196	Osborn et al. v. Chase et al.	201
Moyer v. Preston.....	174, 176	P.	
Murphy Land & Irrigation Co. et al., Joyce et al. v.	256	Parol license for irrigation ditch in Colorado.....	256
Myers, Winter v.	200	Patents, incapacitated soldier entrymen to receive..	26
N.		to disabled soldier entrymen.....	78
Nalder, W. H., Manufacture and installation of precast lock-joint concrete pipe.....	223	Payette-Boise Water Users' Association (Ltd.) v. Fairchild.....	201
Navigability of rivers.....	200	Payment by Government of State tax on gasoline..	288
Newell, F. H., More American homes and increased prosperity.....	282	Percolating water in Utah, use of.....	50
Newlands project crop report, 1921.....	108	Peterson, Atchison v.	174
project dairy herds, statistics concerning.....	115	Peterson, John S., On the Okanogan project.....	124
project, irrigation has helped materially in producing these results.....	95	Poultry farmers, practical suggestions for.....	311
project, progress report on use of aluminum sul- phate on hard soils.....	75	Praisewater, Short v.	256
project, report on cost of drainage construction..	75	Precast lock-joint concrete pipe, manufacture and installation of.....	223
project, report on the estimated cost of pro- ducing alfalfa on the.....	72	Preston, Moyer v.	174, 176
project, the, on the eastern slope of the high Sierras.....	122	Profit from alfalfa seed, Umatilla project.....	325
News for RECLAMATION RECORD readers, good....	213	Profits of dairy industry revealed through herd testing.....	313
New York Canal Co. v. Bond.....	26	Progress report on use of aluminum sulphate on hard soils, Newlands project.....	75
New York Trust Co. v. Farmers' Irrigation District.	229	Project construction cost, how to figure.....	202
Nichols, Yunker v.	174	women and their interests.....	220, 246, 276, 314
Noble v. Union R. Logging Co.....	26	Projects, approved division designations for Reclamation Service.....	27
North Dakota Pumping project, the.....	123	statistics on live-stock carrying capacity of acreage devoted to hay and forage crops on Reclamation Service.....	24
project, Williston Division, crop report, 1921..	35	United States Reclamation Service irrigation, cost and crops.....	156
project, Williston Division, irrigation has helped materially in producing these results.....	139	Public purpose, what is a.....	229
North Platte Canal and Colonization Co., North Platte project, crop report, 1921.....	13	Pulaski Irrigation Ditch Co. v. City of Trinidad..	49
North Platte project crop report, 1921.....	12, 13	Q.	
Notes from the North Platte (Interstate) project....	318	Questionnaire to six reclamation projects, the results of a.....	65
Numbers, H. O., Practical suggestions for poultry farmers.....	311	Questions, Mr. Water User! Can you answer two..	167
O.		R.	
Obligations of Washington Irrigation Districts on account of bonded indebtedness.....	256	Radio on the Salt River project, Arizona.....	211
Oil mixing with irrigation water, damages from....	50	Railroad property in drainage districts, assessment of.....	100
Okanogan project crop report, 1921.....	187	Ranch, the-end-of-the-rainbow.....	250
project, irrigation has helped materially in pro- ducing these results.....	179	Rating curves for canal head gates.....	98
project, on the.....	124	Rawn, A. M., Ditch cleaning harrow for removing moss and weeds from canals and laterals, King Hill project, Idaho.....	196
Operation and maintenance reports.....	8, 28, 52, 80, 102, 144, 181, 203, 231, 258, 290, 326	Reclamation fund, rate of revolution of the.....	192
Oppenlander v. Left Hand Ditch Co.....	174, 176	mail bag, the.....	288, 305
Oregon-California farms open to entry.....	285	project fairs.....	245
Orifices, coefficients of discharge for suppressed submerged.....	253	projects in 1921, summary of crop reports on... ..	97
Orland, California, results of reclamation.....	119	provisions in appropriation act for Department of Agriculture.....	143
Orland project, crop report, 1921.....	9	RECORD index, 1921.....	7
project, irrigation has helped materially to produce these results.....	93	RECORD readers, good news for.....	213

Reclamation fund, rate of revolution of the—Con.	Page.	Salt River project crop report, 1920-21—Con.	Page.
Service from the standpoint of the water users, the work of the.....	118	project, electric power on.....	257
Service orders and announcements, recent.. 39, 63, 78, 101, 180, 195, 230, 255, 289, 323		project, radio on the.....	211
Service projects, the importance of yield in the economical producing of sugar beets on....	168	project, water measurements on the.....	320
twenty years of, June 17, 1902-June 17, 1922..	127, 157	Valley, what reclamation has done for the....	118
Relief to water users on Federal irrigation projects..	76	Sanders, C. D., The Belle Fourche project.....	124
Remsburg, J. D., speaks up for the Minidoka project.	305	Schilling v. Rominger.....	174
Report of Committee on Business Methods, RECLAMATION RECORD, the.....	7	Scofield, C. S., Report on experimental investiga- tions on the use of aluminum sulphate on alkali land on Reclamation Service projects.....	4
on an engineering investigation on the mainte- nance of drains on Reclamation Service projects.....	1	Seepage from drainage ditch reservoir in Colorado, use of.....	200
on cleaning canals with modified disk harrows, Minidoka irrigation project, Idaho.....	22	liability of Government for.....	5
on closing 42-inch outlet pipes in Shoshone Dam.....	45	Seger, B. J., Notes from the North Platte (Inter- state) project.....	318
on cost of drainage construction, Newlands project.....	75	Sewage water in Colorado, use of.....	49
on experimental investigations on the use of aluminum sulphate on Reclamation Service projects.....	4	Short stories of successful settlers.....	242, 271, 306
on hydraulic problems of the Colorado River..	41	Short v. Praisewater.....	256
on the boundary drainage pumping plant, Yuma project.....	21	Shoshone Dam, report on closing 42-inch outlet pipes in.....	45
on the design, construction, and life of metal flumes.....	65	Shoshone project crop report, 1921.....	17, 18
on the estimated cost of producing alfalfa on the Newlands project, Nevada.....	72	project interested in Rumanian milking sheep.	289
Reservoirs, monthly condition of principal Reclama- tion Service.....	8, 28, 52, 80, 102, 144, 181, 203, 231, 258, 290, 326	Silos and silage.....	218
Results, irrigation has helped materially in pro- ducing these.....	93, 138, 178	good reasons for building.....	218
of reclamation at Orland, Calif.....	118	Small-fruit warehouses on Yakima project, develop- ment of.....	257
Rickey Land and Cattle Co. v. Miller and Lux..	175	Smith, H. Kenneth, Increased application for the Venturi flume.....	284
Right of way canceled, Kern River Co.....	26	Smythe, William E., 1861-1922.....	249
Rights to spring on homestead entry.....	256	Soldier entrymen to receive patents, incapacitated.	26
Rindge et al. v. Craggs Land Co. et al.....	200	Sorensen, M., The North Dakota Pumping project.	123
Rio Grande Irrigation Co., United States v.....	174	South African engineer completes reclamation studies.....	101
Rio Grande project cost, woman rose grower makes first payment on.....	270	South Side Pumping Division, Minidoka project crop report, 1921.....	147
project crop report, 1921.....	108	Sperry, G. L., The Flathead (Indian) project.....	126
project, drain cleaning.....	283	Spring on homestead entry, rights to.....	256
project, irrigation has helped materially in pro- ducing these results.....	96	State v. Boyle.....	141
project, the.....	123	Statistician, Current comments.....	214
Riparian doctrine definitely discarded in Montana.	49	Statistics concerning some of the results of irrigation on the Milk River project, Montana.....	48
rights in California.....	200	on live-stock carrying capacity of acreage de- voted to hay and forage crops on Reclamation Service projects.....	24
rights in South Dakota.....	49	Stockton, Robert S., Developing a new farm under irrigation.....	324
Rominger, Schilling v.....	174	Storage conditions of principal reservoirs.....	8, 28, 52, 80, 102, 144, 181, 203, 231, 258, 290, 326
Rose, Hammond v.....	176	Strawberry Valley project crop report, 1921.....	111
Rumanian milking sheep, Shoshone project inter- ested in.....	289	project has done for Payson, what the.....	124
		project, irrigation has helped materially in pro- ducing these results.....	179
S.		Strickler v. Colorado Springs.....	174
Saffer, Finn v.....	256	Success-controlling factors in cooperation outlined.	313
Salt River project crop report, 1920-21.....	29	Successful settlers, short stories of.....	242, 271, 306
project, crop report, 1921-22.....	291	Sugar beets on Reclamation Service projects, the im- portance of yield in the economical production of.	168
		Sun River project crop report, 1921.....	106, 107
		project, irrigation has helped materially in pro- ducing these results.....	96

	Page.		Page.
Sunnyside Division of the Yakima project, the.....	125	V.	
division; Yakima project, crop report, 1921.....	60	Venturi flume, increased application for the.....	284
Supreme Court of the State of Washington in State ex rel. Clancy et al. v. Columbia Irrigation District of Stevens County et al.....	256	W.	
Surridge v. McKay.....	201	Waste and seepage waters, use of.....	49
Sussex Land and Live Stock Co. v. Midwest Refin- ing Co.....	50	Water by irrigation district, delivery of.....	201
Swigart v. Baker.....	26	Water Company, Broder v.....	174
		Water in Washington, appropriation of.....	256
T.		measurements on the Salt River project.....	320
Taxation of public land.....	100	rights in South Dakota.....	6
Taylor, Charles, A Umatilla farmer whose work is sweet to him.....	323	User, Mr. Can you answer two questions.....	167
Taylor v. Hulett.....	177	Users' Association, Irrigation District v.....	288
Telephone service, informal application for.....	141	users on Federal irrigation projects, relief to....	76
Tennessee Copper Co., Georgia v.....	175	users, the work of the Reclamation Service from the standpoint of the.....	118
Thomas v. Guiraud.....	174, 176	versus the hoe.....	267
Thomas v. Kansas City Southern Railway Co.....	100	Webb, Irwin v.....	100
Tieton division of the Yakima project, the.....	125	Weber, D. R., Ranching on the Two Medicine di- vision, Blackfeet (Indian) project.....	126
division, Yakima project, crop report, 1921.....	61	Weld Irrigation Co. and Larimer, Wyatt v.....	174
Title to lands bordering lake in California.....	49	White, Craig v.....	49
Town of Antioch v. Williams Irrigation District et al.....	141	White, Crippen v.....	174
Tracy, Francis G., The Carlsbad project.....	122	Widstoe, Dr. John A., Some odds and ends of irri- gation practice.....	194
Transfer of irrigation water in Washington.....	201	Willey v. Decker.....	174, 176, 177
Traveling expenses of Government employees.....	49	Williams, Dan H., The Tieton division of the Yakima project.....	125
Trieber, William, The Minidoka project.....	121	Williams Irrigation District et al., Town of Antioch v.....	141
Tule Lake Division, Klamath project, farms open to entry.....	285	Wilson, F. E., Drain cleaning, Rio Grande project.....	283
Twentieth annual report, the.....	7	Winter v. Myers.....	200
Twenty-first annual report, the.....	323	Woman rose grower makes first payment on Rio Grande project cost.....	270
Twenty years of reclamation, June 17, 1902-June 17, 1922.....	127, 157	Wood, Fowler v.....	200
Two Medicine Division, Blackfeet project, ranching on the.....	126	Work of the Reclamation Service from the stand- point of the water users, the.....	118
U.		Wyatt v. Larimer and Weld Irrigation Co.....	174
Umatilla farmer whose work is sweet to him, a.....	323	Wyoming v. Colorado.....	173, 257
Umatilla project, crop report, 1921.....	86	Y.	
project, development of the.....	123	Yakima project crop report, 1921.....	60, 61
project, irrigation has helped materially in pro- ducing these results.....	139	project, development of small-fruit warehouses on.....	257
project, profit from alfalfa seed.....	325	project flood, report on.....	7
Uncompahgre project, Boys' and Girls' Club work.....	278	project, the Sunnyside division of the.....	125
project crop report, 1921.....	54	project, the Tieton division of the.....	125
project, eleven years of reclamation on the....	120	project, irrigation has helped materially in pro- ducing these results.....	180
Union R. Logging Co., Noble v.....	26	Yuma project, construction charge for, again upheld.....	25
United States, Arnold et al. v.....	230	project crop report, 1921.....	145
United States, Kern River Co. v.....	26	project, Government not liable for damages to horse on.....	78
United States, Kihlberg v.....	26	project, irrigation has helped materially in pro- ducing these results.....	138
United States, Utah Light & Power Co. v.....	26	project, report on the boundary drainage pump- ing plant.....	21
United States v. Brown et al.....	141	project, the.....	118
United States v. Haga.....	49	Yunker v. Nicholas.....	174
United States v. Ide et al.....	140		
United States v. Rio Grande Irrigation Co.....	174		
Utah Light & Power Co. v. United States.....	26		
Utah Oil Refining Co., Horne v.....	50		

